NAVIGANT
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Independent Review of RECO's AMI Business Case and Recommendations for New Jersey Board of Public Utilities

Capstone Report for:
New Jersey Board of Public Utilities

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[1] On October 11, 2019, Guidehouse LLP completed its previously announced acquisition of Navigant Consulting Inc. In the months ahead, we will be working to integrate the Guidehouse and Navigant businesses. In furtherance of that effort, we recently renamed Navigant Consulting Inc. as Guidehouse Inc.

1. KEY FINDINGS AND RECOMMENDATIONS

Navigant conclusions and recommendations from the evaluation of Rockland Electric Company (RECO)'s advanced metering infrastructure (AMI) business case are summarized below. This report also provides the evaluation team's more general recommendations for the NJ BPU regarding the evaluation of potential future AMI programs in New Jersey.

1.1 RECO AMI Business Case Findings and Recommendations

Navigant finds that there is a high likelihood that RECO's AMI program will be cost-effective with a benefit-cost ratio of 1.5 over a 20-year period from the ratepayer impact measure (RIM) cost test perspective, based on analysis of the estimated costs and benefits of RECO's AMI program.

RECO's 2016 AMI business case does not explicitly identify the use of a standard cost test perspective—e.g., RIM, total resource cost (TRC), or societal cost test (SCT). However, based on the methodologies applied, RECO's cost-benefit analysis (CBA) most closely aligns to the RIM[2] cost test perspective. Navigant believes that the RIM perspective is appropriate for evaluation of this business case. However, the RIM test is a strict perspective and other cost test perspectives may better represent the benefits and costs to ratepayers and New Jersey residents.

To support this finding, Navigant conducted a sensitivity analysis to assess how key assumptions affect the business case results. In this conservative scenario, the evaluation team adopted a conservative view of key assumptions, driving down the present values of many benefits. Navigant also modeled capital costs in the years they were incurred, opting not to use the pre-calculated 20-year depreciated value provided by RECO. The front-loading of capital costs affected the net present value (NPV) cost calculation. However, this approach allowed the evaluation team to better assess the timing and scale of costs to benefit realization—i.e., the team was able to more readily assess the benefits of avoided costs and the drivers of new costs using the same framework. In this conservative scenario, Navigant found a benefit-cost ratio of 1.3 for the RECO AMI program under the RIM test perspective using the assumptions applied. Sections 3 and 4 detail specific assumptions examined through the evaluation team's sensitivity analysis.

Navigant found some AMI benefits to be understated and some potential benefits to be completely absent from RECO's AMI business case. RECO's assessment understates potential non-technical line loss reduction by a factor of three. Customer reliability improvement benefits and mutual assistance cost savings are absent. When these are added in, Navigant estimates a realistic benefit-cost ratio of 1.5 for the RIM test.

Because Navigant believes the societal perspective is more in line with the goals set forth by the New Jersey Energy Master Plan[3], Navigant also assessed RECO's AMI business case from a SCT[4] perspective. This test enables the business case to consider benefits to customers and society, such as avoided customer outage costs and reduced carbon emissions. The evaluation team found the SCT benefit-cost ratio is likely to be 1.5 in the conservative scenario and 1.8 in the realistic scenario.

Navigant finds that RECO's AMI program is positioned to deliver additional benefits that, while difficult to quantify at the time of this report, are expected to have beneficial impact to RECO's customers and the state of New Jersey. Most notably, RECO's AMI program serves as a foundational investment to support the key goals of New Jersey's Energy Master Plan, as summarized in Table 1.

[2] The RIM test is designed to understand how the costs and benefits of a proposed program or investment will impact customer rates in the future. A RIM test greater than 1.0 should lower rates (after regulatory review and recovery) by providing greater monetary benefits than costs, allowing rates to decline in future years.

[3] Draft 2019 New Jersey Energy Master Plan Policy Vision to 2050, June 10, 2019.

[4] A few other states (e.g., New York State) require the SCT as the primary cost test used to evaluate projects and potential investments. For example, Con Edison was required to update its AMI business case to use the SCT as part of its NY BCA Handbook compliance to the NY Public Service Commission's directives.

Table 1. Alignment of RECO's AMI Program with NJ Energy Master Plan Strategies

NJ Energy Master Plan Strategy	Alignment with RECO's AMI Program
Strategy 1: Reduce Energy Consumption and Emissions from the Transportation Sector	✓
Strategy 2: Accelerate Deployment of Renewable Energy and Distributed Energy Resources	✓
Strategy 3: Maximize Energy Efficiency and Conservation and Reduce Peak Demand	✓
Strategy 4: Reduce Energy Use and Emissions from the Building Sector	✓
Strategy 5: Modernize the Grid and Utility Infrastructure	✓
Strategy 6: Support Community Energy Planning and Action in Low-and Moderate-Income and Environmental Justice Communities	✓
Strategy 7: Expand the Clean Energy Innovation Economy	✓

Sources: New Jersey Energy Master Plan, Navigant analysis

The following tables present key findings related to RECO's AMI business case benefits, costs, and overall business case structure.

Benefits Findings
• RECO's benefit calculation methodologies are reasonable, appropriate, and generally aligned with peer utility practices for quantifying benefits. • Some underlying assumptions are not fully aligned with peer utility business cases or fully supported by available evidence. For example, supervisory costs are rolled into hourly labor rates instead of explicit calculations of reduction in supervisory costs. Navigant adjusted these in the conservative scenario. • The AMI business case takes a slightly optimistic view of the timing of accrual of many benefits. Meter deployment began later than planned in the business case, and business process changes often take time before benefits start to accrue. Navigant adjusted these in the conservative scenario. • Reduced bad debt and enhanced revenue protection is understated by a factor of three compared to business cases from utilities such as Con Edison, PSEG Long Island,[5] and FPL. • RECO takes a conservative approach by excluding various benefits that appear in other AMI business cases because they can be difficult to quantify or may otherwise have high uncertainties, such as AMI-enabled demand side management (DSM) programs, time-of-use (TOU) rates, customer reliability improvements, and greenhouse gas (GHG) emissions reductions.

Source: Navigant analysis

[5] PSEG Long Island AMI Business Case filed to Long Island Power Authority as part of the Utility 2.0 Long Range Plan 2018 Annual Update. The evaluation team did not review any materials pertaining to PSE&G New Jersey as part of this assessment.

Costs Findings
• Navigant does not view the projected cost levels and timing by RECO as a significant risk in its assessment of the AMI business case. Major cost components are supported by contractual agreements or vendor quotes obtained by RECO or its parent company from the reputable suppliers. This includes capital and operating costs for meters, the headend system, network infrastructure, meter data management (MDM), and its communication networks.
• All major costs have been developed in partnership with O&R[6] teams already engaged in AMI deployments, lowering the risk of unanticipated costs for RECO.
• The inclusion of a 5% contingency on hardware elements, even those based on vendor quotes, is included in the business case and is a good practice to account for unforeseen costs.
• Meter installation services are based on vendor quotes, and these services are mature and well understood in the industry. Nonetheless, the business case incorporated a 10% contingency to mitigate the slightly higher risk of cost variability.
• For integration services, which typically exhibit more variability, the evaluation team might expect to see a higher contingency assumption built in (e.g., an additional percentage beyond the 10% contingency). However, given the phased nature of the RECO AMI program with that of its parent company, which already has experience with integrating AMI, the RECO deployment is subject to less risk and thus the contingency is reasonable.
• Navigant did observe some costs that were less conservative than those used by RECO's peers. For example, RECO did not factor in costs associated with early meter failures and other in-service replacements. However, in other cases, the team observed RECO to be more conservative in its costs estimates (e.g., IT platform budget overestimated by $1.3 million).
• On balance, Navigant finds RECO's costs to be reasonable, with appropriate risk mitigation built into estimates.

Source: Navigant analysis

Business Case Structure Findings
• RECO's CBA methodology is technically sound and consistent with approaches used for other AMI business cases and grid modernization investments.
• RECO's approach to evaluating benefits is appropriate for characterizing benefits and is consistent with widely accepted industry practice.
• The AMI business case uses an accepted approach for performing evaluations using nominal cashflows and discounting to present value terms.
• The AMI business case aligns costs and benefits from the perspective of the RIM test. This is appropriate and consistent with approaches followed in many regulatory jurisdictions. This perspective excludes various societal benefits that could add value to the business case.
• The analysis spans a 20-year timeframe (2017-2036); this is appropriate as program deployments begin in 2017 (albeit actual meter deployment begins in 2018 and concludes in 2019). The CBA is based on a 20-year meter life, which extends the analysis period through the assumed life of the initially deployed communications network.

Source: Navigant analysis

1.2 Recommendations for Evaluating Future AMI Business Cases

This section presents Navigant's findings, observations, and recommendations to NJ BPU regarding the evaluation of potential future AMI program proposals.

Solely using the RIM test perspective is a narrow lens to assess the effect of AMI on ratepayers and New Jersey in general. While the RIM perspective is useful to determine the effect on ratepayers, it ignores some benefits directly enjoyed by all AMI customers. When AMI is fully integrated with a utility's outage management system, customers experience shorter outages, resulting in direct benefits to those customers.[7] Better information on outages using AMI data would

[6] RECO is a subsidiary Orange and Rockland Utilities, Inc (O&R), which is wholly owned by Consolidated Edison, Inc (Con Edison).

[7] Lawrence Berkeley National Laboratory, *Cost of Updated Value of Service Reliability Estimates for Electric Utility Customers in the United States*, https://emp.lbl.gov/sites/all/files/lbnl-6941e.pdf.

enable RECO to provide real-time alerts to customers on the status and progress of outage restoration efforts, driving customer satisfaction. AMI can enable innovative rate structures such as TOU rates and off-peak electric vehicle (EV) charging rates, which further expand customer options. Third parties can use AMI data to offer innovative services to customers. These examples and others, whether quantified or not, have the potential to sway the business case of an AMI program, even if the results of the RIM test were not net beneficial.

A standardized methodology for conducting cost-effectiveness analysis that aligns with policy goals is helpful in accelerating the regulatory process and ensuring that AMI programs are being assessed fairly. The NJ BPU should consider initiating development of a standardized valuation methodology that best fits New Jersey customer needs and policy goals. This would result in a customized cost test that reflects the priorities of New Jersey stakeholders. Ideally, this could be decided in advance of future business case proposals and would be applied consistently to utility investments. A standardized methodology includes the preferred primary and secondary cost tests (see Section 5.1 for more details), list of benefit and cost categories, equations and data used to quantify each benefit and cost category, and financial modeling methods (e.g., treatment of terminal value). The State of New York initiated this type of process in 2015.[8]

Policy incentives and legislative action can affect future AMI benefits. For example, standardized data management protocols can enable third parties to offer innovative services to customers while still protecting customer privacy. On the other hand, some policies limit the benefits of AMI. For example, the benefit of avoiding truck rolls due to a remote connect switch is forgone in some states by service disconnections requiring a knock on the door.

Other states have proven that AMI is foundational to achieving aggressive environmental goals. New Jersey's environmental goals are in line with states like New York, California, Hawaii, and Illinois. The regulators in those states have relied on AMI to enable the next generation energy efficiency, DSM, and EV charging programs that are crucial to achieving their environmental goals.

[8] The State of New York Public Service Commission released an Order Establishing the Benefit Cost Analysis Framework (NY DPS Case 14-M-0101), which required each investor-owned utility to follow a benefit-cost analysis handbook that provided guidance on these methodological issues. This handbook is used to assess non-wires alternatives, distributed energy resources (DER) programs, and grid modernization investments.

2. INTRODUCTION AND BACKGROUND

On May 3, 2019, RECO submitted a filing for a rate increase based in part on deploying its AMI program, which includes approximately 74,000 meters. RECO submitted a CBA of its installation of AMI meters and associated infrastructure in this filing. The NJ BPU requires an independent analysis of RECO's AMI costs and benefits estimations to help fulfill its obligation to ratepayers. Following a publicly issued request for quotation, Navigant was engaged by the NJ BPU on October 7, 2019 to begin performing this independent third-party evaluation.

This report presents Navigant's findings from its assessment of RECO's filed AMI business case, the related benefit-cost model, the methodology employed, the assumptions, and other supporting documentation filed by RECO and made available to Navigant.

Navigant's independent analysis is presented in four elements:

1. **Benefits:** In Section 3, Navigant reviews the rationale and scope for primary benefit components, calculation methodologies, input assumptions, and the accrual timeframe of each.
2. **Costs:** In Section 4, Navigant reviews the scope and magnitude, calculation approach, and accrual timeframe assumptions of the primary cost components.
3. **Business Case Structure:** In Section 5, Navigant evaluates the overall structure of the business case model.
4. **Comparison with Other AMI Business Cases:** In Section 6, Navigant compares RECO's CBA with three other recent, publicly available AMI business cases: Con Edison (2015), PSEG Long Island (2018), and Duke Energy Kentucky (2016).

2.1 Regulatory Background

In May 2016, RECO petitioned the NJ BPU to approve full deployment of its AMI program.[9] As part of its petition, RECO submitted its AMI program business case and supporting CBA. In its August 2016 order, the NJ BPU approved RECO's AMI program rollout, indicating that recovery of AMI program costs would require a prudency determination following AMI deployment at a future rate case.

In May 2019, RECO filed a petition with the NJ BPU to, in part, collect additional revenue to recover the cost of its AMI program investments following the completion of its AMI deployment.[10] While RECO's AMI business case remained largely unchanged between its original 2016 submission and RECO's 2019 request for cost recovery, the company provided a few notable updates and additional details through its discovery process as part of its 2019 rate case. These updates are noted in Navigant's assessment within this document.

2.2 Summary of AMI Business Case

RECO's AMI investment program, according to its Advanced Metering Infrastructure Business Plan[11], includes the deployment of approximately 74,000 AMI meters, IT infrastructure, and over 200 communication field devices. RECO began making expenditures in 2017 with the deployment of its

[9] NJ BPU Docket No. ER16060524, Rockland Electric Company for Approval of Changes in Electric Rates, Its Tariff for Electric Service, and Its Depreciation Rates; Approval of an Advanced Metering Program; and for Other Relief, May 13, 2016.

[10] NJ BPU Docket No. ER19050552, Rockland Electric Company for Approval of Changes in Electric Rates, Its Tariff for Electric Service, and Its Depreciation Rates; and for Other Relief, May 3, 2019.

[11] NJ BPU Docket No. ER16060524, Rockland Electric Company for Approval of Changes in Electric Rates, Its Tariff for Electric Service, and Its Depreciation Rates; Approval of an Advanced Metering Program; and for Other Relief, May 13, 2016, Exhibit P-6, Schedule 1.

AMI IT platforms and the commencement of field network design activities to support installation of AMI communications equipment, access points, and relays. RECO's major infrastructure deployments began in 2018, with the deployment of its field communication devices. By 2019, RECO completed its AMI meter deployment, barring a few no-access and complex billing customers. As of September 2019, RECO had 654 opt-outs of its AMI program.[12]

RECO's AMI business case is based on a 20-year timeframe between 2017 to 2036. The base year for NPV calculations is 2016, and the analysis timeframe captures benefits and costs over the 20-year life, assuming AMI meters were fully deployed by the third quarter of 2019.

Table 2. AMI Project Primary Capital Deployment

Parameter	Value
Timeline	2017-2036 (20 years)
Base Year (discounting to)	2016
Meter Deployment (as of September 30, 2019)	

Year	Meters	Share %
2017	0	0%
2018	49,149	68%
2019	22,195	30%
Total	**71,344**[13]	**97.7%**

Source: RECO September 30, 2019 AMI Quarter Metrics Report

RECO's AMI business case was filed in 2016 as cost-effective, with benefits of $42.0 million and a cost of $16.5 million, yielding an NPV of $25.6 million. RECO positioned its AMI program to deliver customer value and operational savings, including:

- Customer access to interval energy consumption data
- Enhanced energy efficiency and demand response programs
- Outage notifications and high bill alerts for customers
- Reduced meter reading expenses and operational costs
- Outage management support
- Support of key goals of New Jersey's Energy Master Plan

[12] As reported in RECO's September 30, 2019 AMI Quarterly Metrics Report.

[13] As reported in RECO's September 30, 2019 AMI Quarterly Metrics Report. Per RECO's October 9, 2019 response to interrogatory S-RECO-REV-72 from BPU Docket No. ER19050552, RECO had deployed 71,952 (99.6%) of the 72,230 AMI meters planned.

Table 3. Key AMI Business Case Results as Reported by RECO

Parameter	Value
Benefits ($ Millions)	$42.0
Costs ($ Millions)	$16.5
NPV* ($ Millions)	$25.6
Benefit-Cost Ratio	2.5
Payback (Discounted)	8.2 years

B/C = benefit/cost

*Assumes a discount rate (weighted average cost of capital, or WACC) of 6.52%[14]

Source: RECO AMI business case

2.3 Key Regulatory Documents Used in Review

Navigant reviewed the following key documents during its assessment to develop a foundational understanding of RECO's AMI CBA. In addition, the team reviewed 104 interrogatory responses, seven associated worksheets and six quarterly metric reports to gain a fuller understanding of RECO's AMI program.

- RECO's petition for approval of its Advanced Metering Program (*2016 AMI Deployment Filing*), Docket Number ER16060524, dated May 13, 2016, including:
    - Direct Testimony of Advanced Metering, Smart Grid / Distribution Automation, and Communications Infrastructure Panel (*AMI Panel)*
    - Exhibit P-6, Schedule 1, Advanced Metering Infrastructure Business Plan (*2016 AMI Business Case*)
    - Exhibit RC-2, RECO AMI CBA with NPV Worksheet
    - NJ BPU 2017 Order dated August 23, 2017 (*AMI Deployment Approval*)
- RECO's petition for approval for changes in electric rates (*2019 AMI Cost Recovery Filing*), Docket Number 19050552, dated May 3, 2019, including:
    - Direct Testimony of Keith Scerbo (*Director of AMI and Customer Meter Operations)*
    - Exhibit P-6, March 31, 2019 Quarterly AMI Metrics Update Report

A list of additional materials referenced is provided in Appendix B.

[14] RECO recalculated its WACC (CBA discount rate) in 2019, adjusting it from 6.6% to 6.52%.

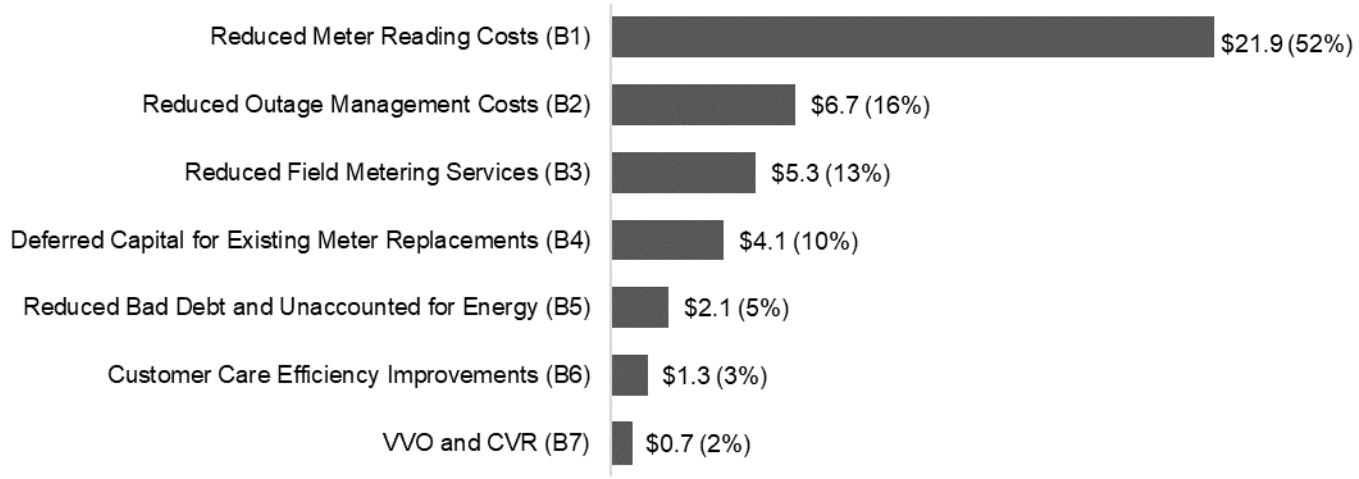
3. ASSESSMENT OF OPERATIONAL, CUSTOMER, AND SOCIETAL BENEFITS

Navigant's review of the benefit components of the RECO AMI program is based on the business case and CBA submitted to the NJ BPU, as well as the additional program details submitted by RECO to the NJ BPU as part of its cost recovery request. Additionally, Navigant's assessment factors in a review of similar AMI business cases in other regulatory jurisdictions, including PSEG Long Island, Con Edison, National Grid, FPL, and DTE Energy.

- With respect to **quantified benefits** (Section 3.1), Navigant thoroughly reviewed each key assumption, supporting evidence, and calculation methodology. In some cases, the evaluation team adjusted the accrual timelines to align with the actual meter deployment schedule and, in some cases, other factors such as project implementation timelines and expected business process changes required. Navigant also performed sensitivity tests wherever the assumptions used were tenuous or not in line with peer utility business cases. These adjustments are captured in the team's conservative scenario with the benefit-cost ratio of 1.3 for the RIM test. These adjustments resulted in lowered magnitudes for certain benefit streams. However, Navigant found that certain other benefits were under-estimated or missing. These are captured in Navigant's realistic scenario with a benefit-cost ratio of 1.8 for the RIM test.
- With respect to **non-quantified benefits** (Section 3.2), these often represent customer and societal externalities, the precise magnitudes of which are relatively uncertain or unpredictable. As such, business cases tend to understate these benefits by taking a conservative approach. In RECO's case, they are entirely un-quantified. Navigant offers examples of peer utilities that have quantified these benefits.

Figure 1 presents the breakdown of benefits across benefit components. The NPV of AMI benefits over the 20-year analysis timeframe is $140.7 million. These benefits are shown in bar graph form below to provide a better intuitive sense for the relative magnitude of these value streams, indicating how important they are in the overall CBA.

Figure 1. NPV ($2016) of Benefits in RECO's AMI Business Case ($ Millions)



Source: Navigant assessment of AMI business case

The following sections explore the benefit streams in more detail, including a brief assessment of each.

3.1 Quantified Operational, Customer, and Societal Benefits

3.1.1 Reduced Meter Reading Costs (B1)

Benefit Component Description			
Description	Benefit stems from cost savings due to reduced manual meter reading. This will save the utility labor, burden, tools, software, and vehicle expenses for meter reading routes.	**Present Value Benefit**	$21.9 million (53% of total benefits)
Benefit Elements	RECO includes the following benefit elements in this category: 1. Meter reading payroll ($21.3 million) 2. Deferred capital – vehicles ($0.2 million) 3. Deferred capital – meter reading system ($0.2 million) 4. Uniforms and safety shoes ($0.1 million) 5. Reduction of compensation and claims for meter reading ($0.1 million) 6. Maintenance of handheld devices ($0.06 million) For no. 1, RECO assumes the AMI implementation will lead to a reduction in nine meter reader personnel at 2,080 hours per year at an average loaded wage rate of $95.37/hr. This yields the net benefits of $21.3 million over 20 years. This loaded meter reader hourly cost consists of the following overheads (see Appendix A for more detail): • Direct and indirect wages • Service center overhead (includes building services, telecommunication, transportation, vehicle maintenance and depreciation) • Supervisory overhead • Administration and General (A&G) and fringe benefits applied to all of above		
Timing	RECO estimated an attrition of nine meter readers on the below ramped schedule: 2017: 20% of full attrition 2018: 60% of full attrition 2019: 100% of full attrition		
Navigant Findings			
Navigant Assessment	Navigant examined the assumptions behind this analysis. The smaller value benefit elements in this category (2-6 above) are in line with peer utility business cases available to the evaluation team. However, the $95.37/hr loaded labor rate used to determine the payroll benefits, the largest benefit in RECO's business case, bears further examination. This loaded hourly rate may be acceptable practice given that RECO uses this capital wage structure to determine the benefits and costs of all its capital projects. However, this loaded hourly rate is atypical compared to peer utility AMI business cases, which have used a different approach: • Some peer utilities calculated supervisory costs as a separate line item,[15] pinpointing the specific meter reading supervisor positions and managerial positions reduced, whereas RECO applied a standard loader, which obscures these details. Some utilities have not claimed this benefit.[16] • Avoided transportation costs and tools/software costs have been calculated separately by other utilities,[17] whereas RECO rolled these into the loaded hourly rate.		

[15] For example, see the Con Edison AMI Business Plan 2015 ("Reduced need for meter reading support staff functions."). New Brunswick Power used a similar approach.

[16] For example, PSEG Long Island.

[17] For example, PSEG Long Island and Con Edison.

	While both benefit elements are seen in other AMI business cases, RECO has not provided bottom-up calculations justifying their magnitudes. RECO's methodology seems consistent with its standard practice to use this loaded wage structure in its capital projects within rate cases. In addition, Navigant finds that assumed meter reading reductions begin a year early. RECO began deployment in January 2018, so the 20% benefits in 2017 are not possible. As a sensitivity test to understand the business case impact in the event that eliminating meter reader positions does not eliminate all the other loaded costs, Navigant removed the supervisory portion of this hourly loaded rate and associated A&G and fringe benefits, to arrive at a revised labor rate of $58/hr (see Appendix A for assumptions and detail). In addition, to better estimate the timing of meter reader reductions, Navigant assumed three meter reader reductions in 2018, three in 2019, and another three in 2020. These sensitivity assumptions resulted in an approximately 40% decrease in the present value of this benefit category as a whole. However, note this decreased magnitude is captured in Navigant's conservative scenario where the benefit-cost ratio still remains 1.3 under the RIM test perspective.

3.1.2 Reduced Outage Management Costs (B2)

Benefit Component Description			
Description	Benefit accrues from reduced costs associated with avoiding service crews responding to false outage reporting as AMI provides visibility to meters where power has been restored and targeted dispatch of crews based on improved situational awareness.	**Present Value Benefit**	$6.7 million (16% of total benefits)
Benefit Elements and Timing	RECO includes the following benefit elements in this category: 1. Reduced false dispatches ($4.5 million) 2. Reduced outage restoration costs ($2.2 million) For no. 1, RECO assumed it would identify 628 false outages via AMI and avoid the same number of dispatches annually for New Jersey. RECO estimated 1 hour would be saved per dispatch and each crew would have two members (saving 2 person-hours). For no. 2, RECO assumed the AMI implementation will lead to reduced outage durations experienced by customers and reduced crew time spent on restoration activities. Accrual of both benefits is proportional to then-projected meter deployment (20% in 2017, 60% in 2018, and 100% in 2019). For both benefits, RECO assumed a loaded hourly rate of $301.97 for each overhead line crew member, or $603.94 for a two-person crew. This loaded hourly rate includes supervisory, service center, and small tools overheads in addition to direct and indirect wages and fringe benefits.		

Navigant Findings	
Navigant Assessment	• The avoided false dispatches benefit appears reasonable and based on sound assumptions. Navigant examined the calculation methodology of the reduced outage restoration costs. The team also examined the $301.97 loaded hourly rate for overhead line crew used in both benefits. Further, Navigant found it necessary to assume a time lag to benefit accrual. • The above sensitivity adjustments (hourly rate and timing) result in this benefit amounting to $6.1 million in present value. This decreased magnitude is captured in Navigant's conservative scenario where benefit-cost ratio still remains 1.3 under the RIM test perspective. • RECO has not quantified customer benefits from reduced outage durations. This benefit is estimated at over $6 million in present value but cannot be counted in the restrictive RIM test approach RECO likely used in the CBA. Using the SCT approach would count customer and societal benefits. • Navigant finds that the benefit accrual timeline in RECO's business case is aggressive. 2017 benefits should be zero given meter deployment began in 2018. In addition, full benefits are only achieved after full integration of AMI with the outage management system (OMS, to be completed in mid-2020) and associated organizational business process change management and training (which may take longer). Navigant expects partial benefits in 2018, 2019, and 2020 and full benefits in 2021. • RECO used a loaded hourly rate of $301.97 for overhead line crew, and a crew size of two per outage job. Similar to the reasoning for meter reading costs above, this loading may be acceptable practice, but the number of supervisor headcount reductions was not provided. Navigant performed a sensitivity test by removing supervisory overhead and associated fringe and A&G costs. This test resulted in a revised rate of $255/hr for overhead crew. • RECO's assumption of two-person outage restoration crew size is reasonable and in line with common utility practice. • Navigant finds it acceptable that RECO claimed outage restoration benefits without claiming crew headcount reductions. This is in line with peer business cases and makes logical sense. If crew headcounts were reduced, it could counteract efficiency gains from fewer, more targeted dispatches. AMI helps expedite outage restoration by avoiding false dispatches and reducing the workload of each crew, thereby reducing overtime costs during storms and wait times for customers. • The overall magnitude of the avoided restoration costs is reasonable and in line with peer utility AMI business cases, which have typically estimated a 5% reduction in outage restoration costs due to AMI. • RECO has not claimed a reduction in mutual assistance costs that result from AMI. Navigant recommends adding this benefit stream, estimated at about $150,000 in present value. Peer utilities estimate a 10% reduction in mutual aid costs following AMI. These occur with a time lag of typically 2-3 years after AMI-OMS integration.

3.1.3 Reduced Field Metering Services (B3)

Benefit Component Description			
Description	Benefit captures avoided costs of manual connects and disconnects for move-in/move-outs and cuts for non-payment, off-cycle reads, field investigations, and emergency disconnects.	**Present Value Benefit**	$5.3 million (13% of total benefits)
Benefit Elements	RECO includes the following benefit elements in this category: 1. Connect/disconnect reduction ($2.5 million) 2. Reduced collection time ($0.7 million) 3. Reduced cut-ins ($0.7 million) 4. Re-read reduction ($0.5 million) 5. Reduced high-bill field test ($0.2 million) 6. Field investigation orders ($0.2 million) 7. Fire cuts ($0.2 million) 8. Reduced zero use field visits ($0.1 million) 9. Future solar installation ($0.1 million)		
Timing	Accrual of benefits is proportional to the initially assumed meter deployment.		
Navigant Findings			
Navigant Assessment	• Navigant finds the underlying assumptions reasonable. The magnitude is consistent with field services cost reductions claimed by Duke Energy Kentucky.[18] But, as a sensitivity test, Navigant adjusted the timeline forward by 1 year to align with the meter deployment schedule and removed supervisory overhead from loaded labor costs from benefits 1-8 above, which rely on these labor rates. • These two adjustments revise the benefit category total down to $3.0 million. This decreased magnitude is captured in Navigant's conservative scenario where the benefit-cost ratio remains 1.3 under the RIM test perspective. • As with other AMI-enabled capabilities, the realization of full remote connect/disconnect benefits is predicated on full technical solution deployment as well as successful business process change management which ensures the business is operationally ready and proper procedures for exception-handling are in place.		

3.1.4 Deferred Capital for Existing Meter Replacements (B4)

Benefit Component Description			
Description	Avoided cost of replacing failed legacy meters.	**Present Value Benefit**	$3.8 million (10% of total benefits)
Benefit Elements	RECO assumed $360,000 per year of avoided cost of legacy meter replacement over 20 years.		
Timing	Benefit amount is $360,000 in 2017 and slowly decreases afterwards.		

[18] Duke Energy Kentucky's revenue improvement estimate per meter was 10 times that of RECO. See direct testimony of Donald Schneider, Jr. on behalf of Duke Energy Kentucky in the Matter of The Application of Duke Energy Kentucky, Inc., for a Certificate of Public Convenience and Necessity Authorizing the Construction of an Advanced Metering Infrastructure before the Kentucky Public Service Commission. April 25, 2016.

Navigant Findings	
Navigant Assessment	Benefit is reasonable and appears conservative with respect to RECO's historical spend on replacing legacy meters, consistently in excess of $400,000 annually before 2016. RECO's annual spend on meter replacements post-2016 appears to be trending down in line with this benefit prediction. This benefit was claimed by other utilities including Con Edison.

3.1.5 Reduced Bad Debt and Unaccounted for Energy (B5)

Benefit Component Description			
Description	AMI helps reduce non-technical line losses by improved meter accuracy, theft and tamper detection, and consumption associated with inactive meters/unoccupied premises.	**Present Value Benefit**	$2.1 million (5% of total benefits)
Benefit Elements	RECO includes the following benefit elements in this category: 1. Locked meter with consumption reduction ($0.9 million) 2. Increased revenue from improved meter accuracy ($0.8 million) 3. Theft of service/irregular meters ($0.2 million) 4. Reduction in revenue loss from unoccupied premises ($0.2 million)		
Navigant Findings			
Navigant Assessment	Navigant believes that RECO understated this benefit by at least a factor of three[19]. While Navigant's conservative scenario leaves this benefit at its original value (still yielding a benefit-cost ratio of 1.3 for the RIM test), the realistic scenario assumes the revised magnitude. RECO used a bottom-up approach, whereas peer utility AMI business cases (e.g., Con Edison, Duke Energy Kentucky and PSEG Long Island) apply a top-down approach to calculate revenue improvement due to AMI. These range from 0.25% of total revenue due to tamper/theft detection, an additional 0.25% due to improved meter accuracy, and an additional 3% reduction in bad debt due to prompt disconnect. Taking a conservative approach, Navigant estimated the total magnitude of this category to be about $700,000 per year (or 0.4% of RECO's annual revenue), yielding a present value of roughly $7 million over 20 years. Note that some jurisdictions such as New York State do not count revenue protection or non-technical loss reductions in the SCT treatment. Navigant believes these enhanced revenues are passed on to customers and represent a customer benefit; as such, they should be included in the SCT treatment.		

[19] Duke Energy Kentucky's revenue improvement estimate per meter was 10 times that of RECO. See direct testimony of Donald Schneider, Jr. on behalf of Duke Energy Kentucky in the Matter of The Application of Duke Energy Kentucky, Inc., for a Certificate of Public Convenience and Necessity Authorizing the Construction of an Advanced Metering Infrastructure before the Kentucky Public Service Commission. April 25, 2016.

3.1.6 Customer Care Efficiency Improvements (B6)

Benefit Component Description			
Description	Benefit produced by an expected reduction in the billing and customer care staff required to handle complaints related to estimated bills, wrong readings, and lack of customer access to data.	**Present Value Benefit**	$1.3 million (3% of total benefits)
Benefit Elements	Benefit comes from avoided costs based on a reduced number of customer care hours spent on handling estimated/high billing complaints and re-issuing bills. AMI all but eliminates the need for estimated bills and makes billing complaint resolution much easier through online access to data.		
Timing	Accrual of benefit is proportional to the originally planned meter deployment.		
Navigant Findings			
Navigant Assessment	• Navigant finds the methodology and estimate of the call center hours reduction reasonable. • The evaluation team adjusted the timing of this benefit to reflect the actual deployment schedule, resulting in a slight adjustment of this benefit (still rounds to $1.3 million). • Other utilities • Some call volume increase might be expected as a function of the AMI rollout itself. Any increase is expected to be handled within the staffing model assumptions. • While some larger utilities have explicitly reduced customer care full-time employee headcounts in this benefit category, Navigant deems it reasonable for a utility of RECO's size to achieve this benefit without headcount reductions. Mechanisms for achieving this benefit without headcount reduction include reduced customer call wait times, reduced overtime costs, and diversion of customer care personnel to market new program offerings.		

3.1.7 Volt-VAR Optimization (VVO) and Conservation Voltage Reduction (CVR) (B7)

Benefit Component Description			
Description	Benefit reflects cost savings by using AMI technology to avoid some of the technology that would be required to implement non-AMI CVR. In this way, AMI CVR also offers incremental energy savings beyond non-AMI CVR implementation.	**Present Value Benefit**	$0.7 million (<2% of total benefits)
Benefit Elements	RECO includes the following benefit elements in this category: • Fuel savings from VVO/CVR • Carbon dioxide (CO_2) savings from avoided energy consumption RECO assumed AMI delivers 0.13% incremental energy savings for VVO and CVR, applied to full system energy consumption in 2020.		

Navigant Findings	

Navigant Assessment	• RECO's inputs for the benefit calculation make sense. However, RECO assumed no costs to enable this benefit, which is probably not a reasonable approach. There will likely be some costs incurred to use the AMI data for RECO's VVO implementation. Below, the team lists conditions that must *all* be true for costs to be zero.) As such, Navigant removed this benefit category from its conservative scenario, which still yielded a benefit-cost ratio of 1.3 under the RIM test perspective.
	  o Advanced Distribution Management System (ADMS) is operational in 2020 and ready to integrate CVR data.
	  o AMI data (e.g., end-of-line voltage data) will already be integrated into the ADMS and ready for use by the CVR control function. This requires the AMI headend to be able to provide the necessary data to the ADMS in near real-time (minutes).
	  o CVR control function already running—either as an ADMS module or as a standalone software integrated to the ADMS.
	  o Capability to use AMI data and AMI end-of-line voltages already purchased and commissioned.
	• No additional integration or software licensing costs required to turn on and use the AMI data.
	• The 0.13% incremental energy savings from using AMI for VVO and CVR seem reasonable and in line with peer utility experience. RECO plans to apply CVR to all of its feeders over time, so that using full system energy consumption is appropriate.
	• RECO used a CVR factor of 0.5, which is on the conservative side relative to peer utility CVR program results available to Navigant.

3.2 Benefits Not Quantified by RECO

Most AMI business cases Navigant has either reviewed or developed contain a set of monetized benefits and a list of non-monetized (e.g., qualitative) benefits. RECO's business case is no different. The evaluation team identified benefits not quantified by RECO, likely because the values are difficult to measure and monetize with any reasonable level of certainty; these benefits are discussed in the following sections. Despite not being monetized in this forward-looking business case, the team believes these are benefits that are achievable in reality.

3.2.1 Enablement of Next Generation Energy Efficiency/DSM and Rates

AMI systems allow for implementation of consumer behavior measures such as energy efficiency, DSM, and TOU rates. Future TOU programs may offer additional benefits not currently captured in their business case. The potential benefits of time-based rate programs depend on local power supply conditions, demand growth, and regulatory policies. Costs are variable depending on the rates offered, but some easy opportunities are available, such as high-bill alerts.

Many states offer financial incentives for utilities to implement DSM measures, particularly energy efficiency programs. AMI can help improve and expand rate program offerings by providing detailed data on electricity use levels and patterns for impact analysis, which enables customers to more actively control their usage and participate in DSM events.

Successful AMI business cases in neighboring jurisdictions (notably Con Edison and PSEG Long Island) all included voluntary TOU rates. The benefits associated with these TOU programs are mainly driven by the forecast participation rate and the per-customer coincident peak load reduction. Con Edison assumed a TOU opt-in enrollment of 15% in its AMI business case. PSEG Long Island assumed TOU enrollment would be 10% for residential and 15% for small business customers, which resulted in $58/meter across all customers. Further examples of the benefits of DSM program offerings are listed in Table 4.

Table 4: Examples of Customer Bill Savings from DSM Program Offerings[20]

Project	Bill Savings	Program Year(s)
Baltimore Gas and Electric	• **$9.08 average credit paid per customer** for four Energy Savings Days • **$2.8 million in bill savings** for all 700,000 participants in the Smart Energy Manager program	2013
Burbank Water and Power	• More than **$1 million in bill savings** for all 25,000 participants in TOU rate program across all program years	2011-2014
Green Mountain Power	• For customers on CPR and CPP, average savings across 14 peak events of **$2.52-$5.88** • Estimate a total annual bill reduction of **$50 per customer**	2012-2013
Oklahoma Gas and Electric	• Average annual savings of **$191.78 for residential customers** and **$570.02 for commercial customers** in its VPP pricing pilot program	2012
Sacramento Municipal Utility District	• Average summer bill savings **exceeding $77 on the TOU-CPP rate** for Summer Solutions participants • Average annual bill savings of just under **$40 per year** for customers who checked out an IHD	2012-2013

Source: US Department of Energy

3.2.2 Enabling DER and EVs

AMI enables real-time pricing and compensation for DER such as rooftop solar, EVs, and thermal energy storage systems. These pricing schemes can be used to engage and encourage customers to consume and generate electricity during times that are beneficial, or at least not detrimental, to the grid and other non-participating customers. Additionally, AMI can support integrating EV charging and evaluating customer charging patterns under various rate options.

Both EVs and DER could have potentially large impacts on the size and timing of electricity demand as the adoption of these technologies grows. Because AMI provides accurate time-stamping of energy flow, utilities can offer real-time pricing or compensate customers for these resources. For example, using AMI to submeter rooftop photovoltaic installations and energy storage units can boost the accuracy and effectiveness of net metering at customer sites.[21]

Similarly, AMI can support the integration of beneficial electrification, such as EVs or heat pumps, by monitoring charging and usage patterns for these emerging technologies to help utilities learn and anticipate how increased adoption of electric devices might affect peak and non-peak demand in the future. Utilities can then offer new rate options that encourage usage during off-peak times. For example, in its AMI business case, PSEG Long Island included plans for an EV TOU rate to be rolled out in 2022.

3.2.3 Reduced GHG Emissions

RECO only quantified GHG emissions reductions from VVO. In addition, emissions reductions are also associated with the following, which were not quantified by RECO:

- Reduced manual meter reading

[20] US Department of Energy, *AMI and Customer Systems Results from the Smart Grid Investment Grant Program*, September 2016. Table 9.

[21] US Department of Energy, *Distribution Automation: Results from the Smart Grid Investment Grant Program*, 2016.

- Reduced field services
- Avoided false outage dispatches
- Customer behavior programs and DSM programs that enable energy usage reductions
- Enabling DER and distributed generation

Based on Navigant's assessment of other AMI business cases, carbon emissions reductions from AMI-enabled DER programs can be an order-of-magnitude higher than carbon emissions reductions from reduced meter reading and truck rolls. It is critical to make reasonable assumptions about AMI's effect on the program impacts and the level of participation expected. Both of these factors typically drive the quantification of carbon benefits.

3.2.4 Improved Reliability and Outage Restoration Times

AMI is known to improve outage duration metrics such as the Customer Average Interruption Duration Index (CAIDI), the System Average Interruption Duration Index (SAIDI), and customer minutes of interruption (CMI). AMI meters can report outages within seconds (last gasp), and these outages can be loaded directly into an OMS outage map via AMI-OMS integration. This is much faster than the call center documenting customer calls and dispatchers converting them into actionable information.

AMI meters also prevent false dispatches by allowing the utility to ping a meter prior to dispatch, making sure the outage is valid and not on the customer side of the meter. By catching false outage reports, crews are freed up for other valid outages, reducing overall restoration times. These factors improve the utility's analysis time and response time to outage events.

In a storm scenario, AMI should have a positive impact on RECO's response. Immediately following a storm, RECO should receive last gasp messages from AMI meters that have lost power. RECO's OMS should automatically roll up these single outages into feeder- or substation-level outages using RECO's connectivity model. This should give RECO's operators and dispatchers a quick overview or major and minor outages in their territory, providing faster and more comprehensive situational awareness than the legacy process (utility would wait for a critical mass of customer calls before drawing conclusions about the size and priority of outages across its territory). The integrated AMI-OMS system allows dispatchers to make quicker and more informed decisions about dispatching repair crews.

AMI should significantly improve the restoration time of single outages that remain in the wake of a large storm. A few hours into the storm when major device-level outages have been restored, utilities are left with identifying laggards—i.e., isolated customers or pockets of customers that are not restored. AMI should help RECO pinpoint these remaining smaller outages through AMI meter pinging. Pinging can help differentiate already-restored outages from still-valid outages, expediting the next phase of restoration effort. Without AMI, a utility typically calls customers back or waits for customers to call in to report persisting outages (these can last days after a storm).

AMI helps identify nested outages. Often crews restore a mainline fault and leave the location, assuming all downstream customers are restored and not knowing there is another fault downstream masked by the larger fault. AMI can help identify these nested outages while the crew is still in the field, saving time and expenses.

Peer utilities have assumed the following outage duration reductions:

- Con Edison's AMI business case assumed a 15-minute improvement in CAIDI.
- DTE Energy's CAIDI improved more than 30% following AMI.[22] Some estimates attribute 7% CAIDI improvement to AMI.[23]

However, it takes time and cost to adapt business processes and procedures to achieve (and document) a systematic change in outage restoration processes. RECO is scheduled to complete its AMI-OMS integration in Q2 2020[24].

It can be difficult to isolate the impact of AMI on reliability improvements. Other grid hardening and grid automation programs may be underway concurrently with AMI. Some approaches to isolate the impact of AMI may include:

- Case study approach, where AMI impacts are directly observed and documented in major outage events.
- Adjusted comparison to historical data, excluding specific outage causes (e.g., maintenance) and excluding major event days to control for weather.
- Measuring the time difference between outage reports from AMI and customer calls (requires software development involving call center data logs and AMI data).
- Measuring the number of false dispatches prevented by AMI.

AMI does not impact outage frequency and related indices such as system average interruption frequency index (SAIFI). RECO has not claimed SAIFI impacts associated with AMI.

3.2.5 Impact on RECO's Ability to Restore Outages During March 2018 Nor'easters

As part of the analysis, Navigant was asked to examine the impact of AMI on RECO's ability to restore outages during the March 2018 nor'easters. In March 2018, only 83 AMI meters were deployed (per the September 30, 2019 quarterly metrics report). Using AMI meters for storm response would depend on a critical mass of AMI meters in the field to aid in transmitting information packets to endpoints and back to the headend system. The deployment level was too small to be of use in the March 2018 nor'easters' restoration effort. In addition, RECO issued its first AMI-OMS integration release in May 2016 (per its Q3 2019 quarterly metrics report), which enabled AMI meter remote power status checks. In absence of this functionality, RECO could not have used AMI for outage management in March 2018.

3.2.6 Improved Power Quality

AMI can improve the power quality experience for customers and reduce the utility's costs to detect and resolve power quality issues in two ways:

- AMI meters can be programmed to send alerts whenever phase voltage goes out of specified ranges. These can be customized for industrial, residential, or key account meters.

[22] DTE Smart Grid Annual Report 2019 before the Michigan Public Service Commission, February 15, 2019.

[23] Itron presentation to Rhode Island Public Utility Commission, 2018 (http://www.ripuc.org/utilityinfo/electric/PST_GCF_P_2.pdf).

[24] RECO's September 30, 2019 AMI Quarterly Metrics Report.

- AMI meters communicate periodic voltage readings (interval data), which makes it simple to diagnose and troubleshoot voltage complaints.

3.2.7 Better Forecasting Ability

DTE Energy estimated[25] that incorporating AMI data into its forecasting process has increased service area load forecast accuracy by 1.1 percentage points. For DTE, each 0.1% increase in forecast accuracy translates to approximately $5 million in improved margin, which is then passed on to the customers. If RECO follows a similar approach to incorporate AMI data into its forecasting process, it is possible for the utility to realize a proportional amount of savings.

[25] Presentation by DTE: "You Had Me At "Multi-Million Dollar Bottom Line Impact," October 25, 2019, Utility Analytics Week.

4. ASSESSMENT OF COSTS

Navigant's review of the cost components of the RECO AMI program is based on the business case and CBA submitted as part of its deployment approval request to the NJ BPU, as well as the additional program details submitted by RECO to the NJ BPU as part of its cost recovery request. Additionally, Navigant's assessment factors in a review of similar AMI business cases in other regulatory jurisdictions.

RECO's AMI program consists of three major components for which capital costs were captured: AMI meters, the AMI communication network (i.e., field devices such as relays and access points), and the AMI IT platform. The AMI IT platform includes the AMI headend (HE) system, the meter data management system (MDMS) and the meter asset management system (MAMS).

A large proportion of the costs are supported by vendor quotes provided to O&R as part of a shared project between O&R and RECO, including capital and operating costs for AMI meters and communications system, MDMS, MAMS, communication installation services, IT integration services, meter installation services, and communications installation services.

The total project costs of the RECO AMI program capture all AMI cost components over the 20-year analysis period assumed in the business case. Cost elements include the following (detailed in Table 5):

- Capital, operational and replacement costs of electric AMI meters and modules
- Communication network
- IT platforms (i.e., headend system, MDMS, MAMS, software, etc.)
- Installation and integration costs
- Incremental utility staffing requirements
- Ongoing investments (e.g., data backhaul costs, IT platform maintenance costs and other shared service costs between O&R and RECO, etc.)

Ongoing costs are largely constant year-over-year following the initial AMI rollout and include data and communication costs, back office system maintenance costs, and ongoing labor. Over the 20-year analysis timeframe, the present value of the total capital costs account for $18.2 million and total operating costs for $3.6 million. The largest share of project costs is from AMI meters and modules, AMI maintenance, and meter installation costs. Combined, they account for $9.7 million, equivalent to 45% of total AMI costs.

Table 5. AMI Project Cost Components

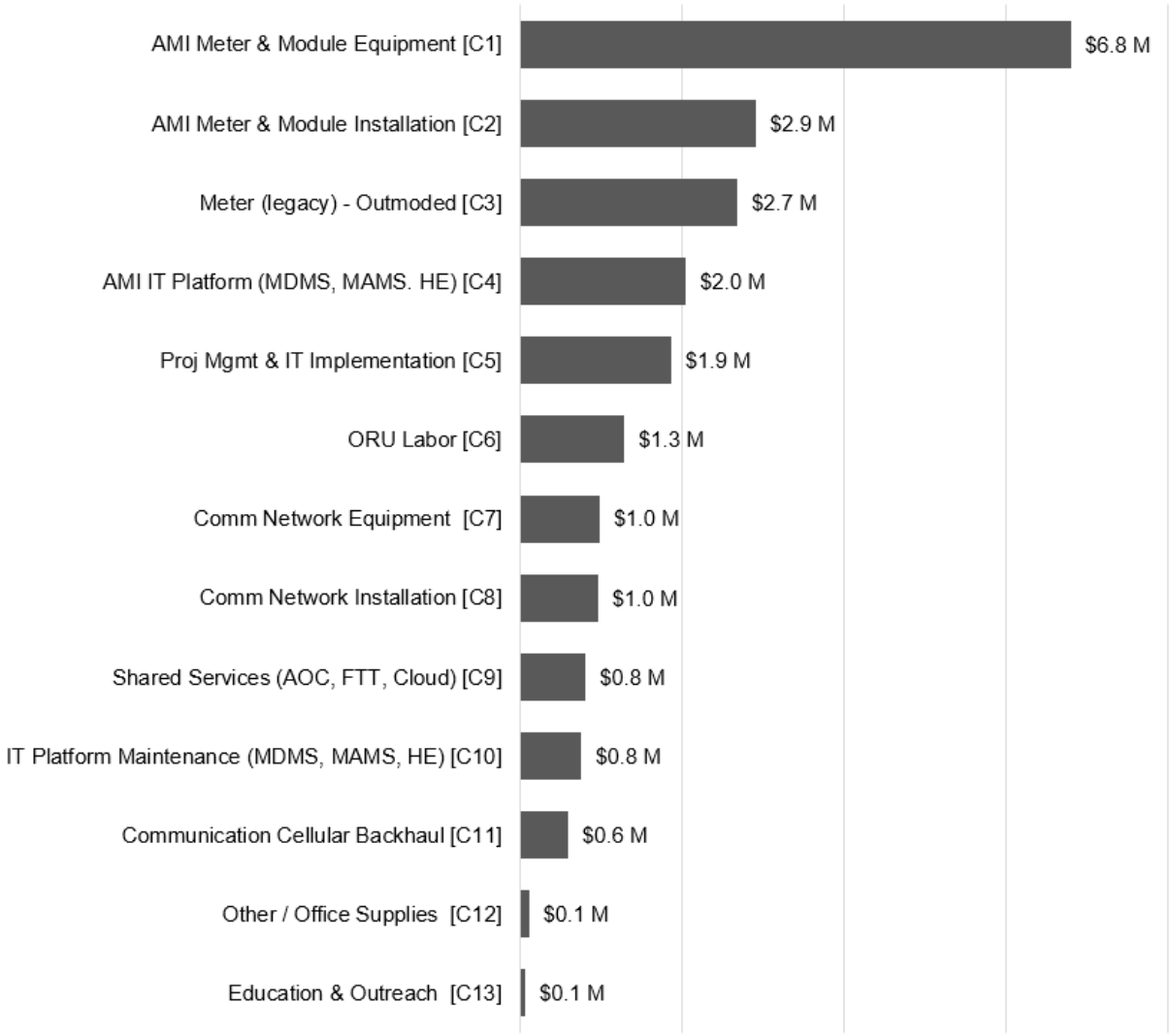
ID	Cost Components	Cost Category	Present Value ($ Millions)	% Costs
C1	AMI Meter and Module Equipment **[C1]**	Capital Expense	**$6.8 M**	31.2%
C2	AMI Meter and Module Installation **[C2]**	Capital Expense	**$2.9 M**	13.3%
C3	Meter (Legacy) – Outmoded **[C3]**	Amortized Costs	**$2.7 M**	12.3%
C4	AMI IT Platform (MDMS, MAMS, Head End) **[C4]**	Capital Expense	**$2.0 M**	9.4%
C5	Project Management & IT Implementation **[C5]**	Capital Expense	**$1.9 M**	8.5%
C6	ORU Labor **[C6]**	Capital Expense	**$1.3 M**	5.9%
C7	Comm Network Equipment **[C7]**	Capital Expense	**$1.0 M**	4.5%
C8	Comm Network Installation **[C8]**	Capital Expense	**$1.0 M**	4.4%
C9	Shared Services (AMI Operations Center, Cloud Services, etc.) **[C9]**	Ongoing O&M	**$0.8 M**	3.7%

ID	Cost Components	Cost Category	Present Value ($ Millions)	% Costs
C10	IT Platform Maintenance (MDMS, MAMS, HE) **[C10]**	Ongoing O&M	**$0.8 M**	3.4%
C11	Communication Cellular Backhaul **[C11]**	Ongoing O&M	**$0.6 M**	2.7%
C12	Other/Office Supplies [**C12]**	Ongoing O&M	**$0.1 M**	0.5%
C13	Education & Outreach **[C13]**	Ongoing O&M	**$0.1 M**	0.3%
Total			**$28.6 M**	**100%**

Source: RECO AMI business case

Figure 2 illustrates the relative magnitudes of the main cost drivers.

Figure 2. NPV ($2016) of Costs in RECO's AMI Business Case ($ Millions)



Source: Navigant analysis of RECO AMI business case

The top five capital expenses (Section 4.1) and top three ongoing operational and maintenance expenses (Section 4.2), which together represent 85% of the total costs, are explored in more detail in the following sections.

4.1 Capital Expenses

4.1.1 AMI Meters and Modules Equipment (C1)

Cost Component Summary			
Description	Component of cost representing metering equipment installed on a customer's premise.	**Present Value (2016)**	$6.8 million (31% of total costs)
Cost Elements	RECO includes the following cost elements in this category: • AMI meters and modules (cost per meter) • Meter vendor costs • Taxes and standard RECO overhead loaders (e.g., allowance for funds used during construction [AFUDC],[26] fringe, etc.) AMI meter and module costs are based on vendor quotes provided to O&R and RECO. RECO also incorporates a 5% contingency on meter and module equipment costs.		
Timing	RECO projected AMI meter and module cost accrual based on scheduled meter deployments from 2017 to 2019. Actual meter deployment began in 2018 and was completed in 2019. There is no evidence of meter repair costs (out-of-warranty costs) starting in 2023 when the meter manufacturer warranties end.		
Navigant Findings			
Navigant Assessment	• RECO was able to take advantage of AMI programs recently executed or under execution by its parent company (O&R) by using volumetric discounts for vendor support and equipment secured by O&R. • The unit cost assumed for meters is consist with the catalog costs for residential and commercial AMI meters provided by RECO as part of its response to rate case interrogatories.[27] • Including a smaller contingency on fixed vendor quotes (5%) is good practice to account for unforeseen costs. However, the absence of any cost assumptions for early meter failures and other in-service meter replacements represents a gap in RECO's CBA. It is practical to include some cost assumption to account for a small percentage of meters (e.g., 0.5% per year). Navigant recognizes that the survivor curve provided by RECO as part of its filed depreciation study illustrates that, while some percentage of meters are likely to fail before the assumed 20-year asset life, a sizable population of meters will remain in service beyond their assumed service life. As such, Navigant does not believe that RECO's exclusion of an in-service replacement cost significantly affects the overall CBA outcome in this case.		

[26] AFUDC is the estimated cost of borrowed and equity funds used to finance construction projects that are capitalized and recovered through depreciation over the service life of the plant.

[27] Rockland Electric Company 2019 Rate Case: ER19050552, Set S-RECO-REV Question No. 72.

4.1.2 AMI Meters and Modules Installation (C2)

Cost Component Description			
Description	Component of cost representing the costs of vendor-provided installation services along with internal personnel needed to install AMI metering equipment.	**Present Value (2016)**	$2.9 million (13% of total costs)
Cost Elements	RECO includes the following cost elements in this category: • Meter installations • Socket upgrades • Taxes and standard RECO overhead loaders (e.g., AFUDC, fringe, etc.) Costs are based on vendor quote provided to O&R and RECO. RECO incorporated a 10% contingency on installation costs. Actual installation costs have not been provided.		
Timing	Installation cost accrual is commensurate with the meter deployment schedule.		
Navigant Findings			
Navigant Assessment	• RECO's installation cost assumption, which was based on per-meter installation costs multiplied by the volume of meters planned for deployment plus the standard loaders consistently used throughout the CBA, is a simple and straightforward approach to estimating these costs. • The per-unit installation cost was set at roughly one-half of the equipment cost, a commonly used rule to estimate installation costs. • Installation services are more variable than meter hardware costs; as such, it is appropriate for installation costs to be assigned a higher contingency rate (10%) than that applied to the metering and module equipment costs (5%).		

4.1.3 Outmoded Legacy Meters (C3)

Cost Component Description			
Description	Component of cost representing the unrecovered costs for legacy electro-mechanical and solid-state meters due to the implementation of AMI.	**Present Value**	$2.7 million (12% of total costs)
Cost Elements and Timing	• Amortization of the deferred costs of unrecovered remaining book value of legacy meters over a 15-year period. • RECO will use a 15-year straight-line recovery, resulting in an annual expense of approximately $350,000.		
Navigant Findings			
Navigant Assessment	• Removal of legacy meters was required as part of RECO's AMI program implementation and benefits realization. • The amortization of the unrecovered costs over 15 years is appropriate to attenuate the customer rate impacts associated with AMI implementation while enabling customers to recognize benefits. • The longer amortization also assigns costs more uniformly between current customers and future customers who will see current benefits (and perhaps greater benefits as additional customer programs enabled by AMI are rolled out).		

4.1.4 AMI IT Platforms (C4)

Cost Component Description			
Description	Component of cost representing the meter headend system, the MDMS, and the MAMS.	**Present Value (2016)**	$2.0 million (9.4% of total costs)
Cost Elements and Timing	RECO includes the following cost elements in this category: • Software licensing costs per meter • 3-year maintenance pre-purchase • Implementation costs • Integration (conversion) software • Associated server and storage costs • Taxes and standard RECO overhead loaders (e.g., AFUDC, fringe, etc.) • 10% contingency Initial AMI IT platform rollouts began in 2016 for Con Edison and O&R. IT platform costs have been allocated to RECO at 16.69% in accordance with its joint operating agreement with O&R. Joint operating agreement economies of scale captured include production, test, and development network servers and controllers; software costs include licenses, subscriptions, and databases. Costs associated with integrating the AMI IT platform with customer information management and OMS were included in O&R's earlier AMI deployment, resulting in savings for RECO.		
Navigant Findings			
Navigant Assessment	• The shared cost model for AMI platform components such as MDMS and headend systems are common across the industry where practical and significantly improves the cost-effectiveness of those systems. • Navigant finds this approach to be highly cost beneficial.		

4.1.5 AMI Project Management and IT Implementation (C5)

Cost Component Description			
Description	Component of cost representing internal and external project and implementation support.	**Present Value (2016)**	$1.9 million (8.5% of total costs)
Cost Elements	RECO includes the following cost elements in this category: • O&R project labor costs • Internal shared resources • System integration oversight • Taxes and standard RECO overhead loaders (e.g., AFUDC, fringe, etc.) RECO also incorporates a 10% contingency on this cost component.		
Timing	Costs are predominantly incurred upfront in 2018, parallel to the MDM rollout and prior to meter deployment.		
Navigant Findings			
Navigant Assessment	• System integration cost assumptions are reasonable. • The higher contingency rate (10%) will better mitigate the risk of unexpected, additional system integration costs (system integration cost tends to be more variable than hardware or installation costs).		

4.2 Ongoing Operational and Maintenance Expenses

4.2.1 Shared Services (AOC, FFT, Cloud) (C9)

Cost Component Description			
Description	Ongoing costs associated with operational costs that are shared between RECO, O&R, and Con Edison.	**Present Value (2016)**	$0.8 million (3.7% of total costs)
Cost Elements	RECO includes the following cost elements in this category: • Operation of the AMI Operations Center • AMI field technician training program • Cloud services		
Timing	Costs to support the AMI operations team begin in 2020 commensurate with the first year of full AMI deployment. Costs reflect the transition to a dedicated AMI operations team beginning in 2020, and full-time IT support throughout the deployment and some post-deployment period.		
Navigant Findings			
Navigant Assessment	Navigant finds the costs for the dedicated post-deployment AMI team incorporate funds to cover the shared costs of staffing the meter operations roles identified in interrogatories.[28] The evaluation team did not, however, have enough project plan details to determine if the specific roles being staffed can ensure the transition of AMI processes and operations into business-as-usual.		

4.2.2 IT Platform Maintenance Cost (C10)

Cost Component Description			
Description	Ongoing costs associated with elements of MDM, MAM, and headend system, including annual maintenance, licensing, software, and hardware updates.	**Present Value (2016)**	$0.8 million (3.4% of total costs)
Cost Elements & Timing	RECO includes the following cost elements in this category: • MDM, MAM, and headend system maintenance • MDM, MAM, and headend system licensing • MDM, MAM, and headend system hardware • MDM, MAM, and headend system software Costs are based on vendor quotes provided to Con Edison and O&R prior to initial deployment. Licensing, hardware, and software costs are incurred upfront in 2017 prior to meter deployment, while maintenance fees are incurred annually from 2019 through 2036. MDM maintenance costs reflect software maintenance costs and integration fees, among others.		
Navigant Findings			
Navigant Assessment	Navigant finds these costs to be appropriate and associated cost assumptions to be reasonable given the shared cost model used by RECO.		

[28] Rockland Electric Company 2019 Rate Case: ER19050552, Set RCR-AMI Question No. 59.

4.2.3 Communication Cellular Backhaul (C11)

Cost Component Description			
Description	Ongoing costs associated with the transmission of AMI data from meters to the headend system.	**Present Value (2016)**	$0.6 million (2.7% of total costs)
Cost Elements	RECO includes the following cost elements in this category: • Radio frequency (RF) communications services for a wide area network (WAN) • Public digital cellular communication services Costs are based on estimates provided by the service provider.		
Timing	Costs begin in 2017 with the setup of the communications network and moderately ramp up during the deployment period, leveling off beginning in 2020 following full AMI deployment.		
Navigant Findings			
Navigant Assessment	Navigant finds these costs to be necessary and reasonable to effectively operate an AMI program.		

5. ASSESSMENT OF BUSINESS CASE STRUCTURE

Navigant evaluated the overall structure of the business case model and the application of key financial parameters as part of its review of RECO's AMI business case. Section 5.1 describes Navigant's findings related to the CBA framework, the CBA perspective, consistency in the accrual of costs and benefits, cashflow discounting, and the analysis time horizon. Section 5.1 also focuses on the escalation rate used for costs and benefits and the discount factor used in the discounting of cashflows. Section 5.2 considers the alternatives to AMI deployment as filed by RECO.

5.1 Analysis Framework

5.1.1 Analysis Time Horizon

The analysis period over which costs and benefits are analyzed is often based on the longest asset life included in the investment under consideration. In this case, the longest asset life is of AMI meters at 20 years. Accordingly, the AMI business case appropriately extends from 2017 (the first year of capital expenditure) to 2036.[29]

Some utilities have assumed an AMI service life of 15 years, and other utilities have indicated an expected service life for their AMI meters to be 20 years or beyond.[30] Navigant has not determined those meters to be of the same manufacturer, model, or generation as those AMI meters deployed by RECO. A 20-year AMI service life is in line with the manufacturer's recommended service life in this case. RECO's service life assumption for the AMI meters aligns with its service life estimates used in the depreciation and amortization calculations of its other solid-state meters, which rely on survivor curves presented in its 2017 depreciation study.[31] While Navigant does note that asset survivor curves suggest some increasing rate of meter failures toward the end of the 20-year period, the curves also suggest a large population of meters survive beyond the assumed 20-year service life. As such, Navigant considers RECO's use of a 20-year CBA time horizon be appropriate.

5.1.2 Escalation Rate

The AMI business case uses an escalation rate assumption of 2% applied both to costs and benefits where appropriate. Navigant finds this escalation rate to be appropriate and generally consistent with other business cases. Two of the three AMI business cases the team reviewed reported the escalation assumption applied—both Con Edison and PSEG Long Island applied a 2.1% inflation rate. RECO's escalation rate is also largely consistent with a commonly used proxy, the Consumer Price Index (CPI) rate.[32]

5.1.3 Discount Rate

In general, the discount rate used by utilities to discount cost and benefit cashflows is an organization's WACC, as this reflects the blended cost of capital based on the current capital

[29] One of the complications of deployments over multiple years (e.g., meter deployment from 2017 to 2019) is that only assets deployed in the first year of the deployment window will capture benefits over their full lifetime. Meters deployed in 2017 will capture 20 years of benefits through 2036, but meters deployed in 2018 and 2019 will only capture 19 and 18 years, respectively. The impact is that benefits can be underestimated; however, this factor can be counterbalanced by the potential need to replace the assets at that point and the associated cost. Thus, it is common practice to simply truncate the benefit and cost streams at the end of the analysis period and adjust for any end effects.

[30] Examples include Con Edison's 2015 AMI CBA filed with the New York Service Public Commission, Duke Energy Carolinas' 2017 AMI CBAs filed with the North Carolina Utilities Commission, and Duke Energy Kentucky's 2016 AMI CBA filed with the Public Service Commission of Kentucky.

[31] NJ BPU Docket No. ER19050552, Exhibit P-7, Schedule 3.

[32] For the 12-month period between April 2018 and April 2019, the Bureau of Labor Statistics reported a CPI for all urban consumers of 2.0%.

structure. In its original 2016 business case and CBA, Navigant confirmed RECO used a 6.6% discount rate to correspond with its then WACC. In its 2019 cost recovery filing, RECO revised its WACC down to 6.52%[33] to reflect changes in RECO's debt-to-equity ratio and changes to return on equity (ROE). Accordingly, RECO adjusted the discount rate used in its most recent CBA model updates to 6.52%. RECO's discount rate is in line with the rates used in the AMI business cases reviewed by Navigant, which ranged from 6.1% (Con Edison) to 7.05% (Duke Energy Kentucky).

5.1.4 Accrual of Costs and Benefits

RECO's approach for evaluating benefits is appropriate, in general. However, Navigant found the timing of some benefit recognition to be aggressive as compared with standard practice and the meter deployment schedule. In its 2016 business case filing, RECO projected that deployment would start in 2017 and as such assumed 20% of the total benefit projected value in 2017. In reality, meter deployment began in January 2018, and 2017 benefit accrual was presumably zero. Navigant accommodated this change in its analysis of the CBA. Notwithstanding this discrepancy in the amount of benefit recognized immediately following deployment, RECO's CBA framework recognizes the benefits and costs of its AMI program consistently. A more detailed assessment of benefits is presented in the Section 3.

5.1.5 Terminal Value

Terminal value refers to the value of an asset at the end of the analysis period (i.e., 2036). It is meant to confirm that no values are left on the table—e.g., a 20-year asset installed in 2036 will continue to produce benefits through 2055. It would be unfair to burden the business case with the full cost of that asset without either (1) considering the future benefits through 2055 associated with that asset, or (2) crediting the salvage value of that asset in 2036.

Because of the uncertainty associated with calculating benefits beyond 2036 (option 1), Navigant opted to assess terminal value in the context of crediting back the salvage value of assets in 2036 (option 2). The evaluation team estimated that the terminal value of the assets at the end of the analysis period would be trivial relative to the other costs considered in the business case for the following reasons:

- Based on the 2017 depreciation study, AMI meters are expected to have a useful lifetime of 20 years. While some meters are expected to fail before 20 years, others are proportionally expected to last beyond 20 years. The team made the simplifying assumption that no additional meter replacement costs would be incurred to replace meters at the end of their life (<20 years) and, therefore, no salvage value needs to be considered for AMI meters installed near the end of the analysis period.
- RECO did not assume an AMI communications replacement at year 16, noting that any future replacement would be subject to regulatory approval at the time of replacement[34]. As such, the evaluation team assumes no replacement cost and thus, no salvage value associated with the communications system at the end of the analysis period.

5.1.6 NPV (Cashflow Discounting)

The AMI business case uses the accepted approach for dealing with nominal cashflows, real dollar adjustments, and discounting to NPV terms. Benefit and cost cashflows are treated consistently over the analysis timeframe in nominal terms by escalating values annually with appropriate price indices. Nominal cashflows are then discounted to the base year with the nominal discount rate.

[33] Rockland Electric Company 2019 Rate Case: ER19050552 Response to BPU Interrogatories – Set RCR-AMI-16, revised July 23, 2019.

[34] Rockland Electric Company 2019 Rate Case: ER19050552 Response to BPU Interrogatories – Set RCR-AMI Question 48.

5.1.7 Cost Test Perspective

RECO's AMI business case does not provide a clear perspective of which cost test is used to report the net benefits of the AMI program. The NJ BPU also did not provide guidance on which cost test method was preferred. It appears the RIM test was performed as this test considers the costs, benefits, and revenues from the utility perspective to determine revenue requirements and rates. Navigant suggests that the RIM test alone is a narrow perspective from which to properly evaluate an AMI program and does not fully align with New Jersey's goals.

Some jurisdictions, including New York, are moving toward the SCT, which measures benefits to customers and external benefits to society. Other states are exploring the use of the resource value test (RVT) as described in the National Standard Practice Manual for Energy Efficiency,[35] which claims that the five standard cost tests may be insufficient to align with the policy goals of a particular jurisdiction. The RVT allows for flexibility in the treatment of specific cost and benefit streams to steer investments that align with applicable policy objectives.

5.1.8 Opt-Out Rate

In its initial business case, RECO proposed and implemented a monthly fee of $15 to be applied to customers who opt out of its AMI program. This fee is intended to cover the incremental cost of a monthly manual meter read. In its cost recovery filing, the company disclosed that since completing its original business case in 2016, the incremental cost to manually read a customer meter has risen to $17 per monthly meter read due to increases in labor costs.[36] Additionally, RECO proposed and applied a $45 meter change-out fee to cover costs associated with a meter exchange for customers who opt out of the AMI program (or those customers who subsequently opted back in). Again, this fee is meant to correspond to incremental cost causation.

This fee is in line with the other utilities assessed, as summarized in Table 6.

Table 6. Opt-Out Fees, Proposed or Actual

Utility AMI Business Case	One Time Opt-Out Fee	Monthly Recurring Charges
Con Edison[37]	$104.74	$9.50
Duke Energy Kentucky[38]	$100	$25
Dominion Energy (proposed)[39]	$84.53	$29.20

Source: Navigant analysis

Beyond RECO's establishment of opt-out fees, Navigant did not find evidence of an assumed opt-out rate embedded in its base case CBA results. As of September 30, 2019, RECO has reported 654

[35] National Efficiency Screening Project. *National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources*. Edition 1, Spring 2017.

[36] In the direct testimony during RECO's 2019 AMI program cost recovery request, Witness Scerbo stated that the company believes it to be reasonable to wait until a future rate case to make any adjustments to its opt-out fees.

[37] Con Edison, "Automated Meter Reading Opt-Out Application" (https://www.coned.com/-/media/files/coned/documents/our-energy-future/technology-and-innovation/smart-meters/amr-opt-out-application.pdf?la=en, accessed November 4, 2019).

[38] Duke Energy, "Smart Meter Opt Out" (https://www.duke-energy.com/our-company/about-us/smart-grid/smart-meter/smart-meter-opt-out accessed November 4, 2019).

[39] Virginian Pilot, "Dominion's smart meters are coming. If you want to opt out, it could cost you." November 4, 2019. https://www.pilotonline.com/business/dp-nw-smart-meters-20191104-fnk5krmeljcjha6pul4c3qt56a-story.html.

customers (less than 1%) who have opted out of its AMI program.[40] Navigant determined that this 1% opt-out rate and the applied opt-out fees have a nominal overall impact on RECO's CBA.

The rate the AMI program experienced opt outs in the RECO service area is in line with opt-out rates assumed by other utilities. In its AMI business case assessments, National Grid assumed 1%; Con Edison assumed different opt-out rates for each of its service territories—all are below 1%.

5.2 Alternatives to Full AMI Deployment

As part of its original petition to deploy AMI, RECO filed testimony[41] indicating that alternative deployment approaches were considered; however, RECO determined that full-scale AMI implementation offered the greatest value to its customers. The alternatives considered included the following:

- Deployment of automated meter reading (AMR) meters
- Partial deployment of AMI meters
- Delayed or extended deployment of AMI meters

5.2.1 AMR Meter Deployment

RECO states AMR meters do not assist in storm resiliency because the meters do not have two-way communication to report meter status to the utility. AMR does not unlock the full benefits of AMI and deploying AMR as a step toward AMI would be more expensive.

Navigant believes this to be a reasonable assertion supported by the experience of other jurisdictions. The benefits of AMR are limited to metering and billing functions. These can be substantial enough to make AMR a viable investment in many jurisdictions. However, AMI adds a host of other benefits to the portfolio, including reliability,[42] customer choice and control over energy use, energy efficiency, and TOU rates. All are becoming vital in the modern distributed grid infrastructure and are espoused in New Jersey's Energy Master Plan.

Many of these benefits of AMI can be tricky to monetize due to large uncertainties. As such, making the business case of going from AMR to AMI a complex one. By opting for AMI, New Jersey can ensure it is on the path to achieving its state goals in a way that opting for AMR would not.

5.2.2 Partial AMI Meter Deployment

In its business case and supporting documentation, RECO indicated that partial deployment would limit the AMI-enabled benefit to only some customers, unfairly offering flexibility to make energy decisions to some but not all. Full deployment would enable full support to other grid programs such as outage detection, VVO, and DER enablement. Partial (spotty) deployment would result in decreased cost efficiencies (e.g., if the goal was to eventually convert all customers to AMI, those total net costs would be higher).

Navigant finds that a partial deployment would result in suboptimal benefits associated with cost efficiencies. Because of the volumetric pricing received by RECO, a reduction in the volume of meters deployed would have implications on RECO's per-meter cost. Additionally, to achieve meter reading

[40] Rockland Electric Company 2019 Rate Case: ER19050552 Response to BPU Interrogatories – Set RCR-AMI-INF question 2.

[41] NJ BPU Docket No. ER16060524, Advanced Metering, Smart Grid/Distributed Automation, and Communications Infrastructure Panel Witness Testimony.

[42] Using AMR for reliability improvement has been fraught with technical challenges in other jurisdictions. For instance, PECO's ability to ping meters to remotely verify power restoration improved from about 12% with AMR to more than 95% using AMI. (US Department of Energy, Smart Grid Investment Grant report: Smart Grid Investments Improve Grid Reliability, Resilience and Storm Response. 2014).

cost reduction benefits, a partial deployment would have to be specifically targeted to meter reading routes rather than simply reducing the concentration of meters uniformly. Assuming the cost of meter deployment would factor in the electric rates of all customers, a partial deployment would result in a disparity between AMI-enabled services offered to some customers and not others.

Additionally, a partial deployment would result in suboptimal benefits associated with AMI system performance. Because RECO is leveraging a mesh communication network, a reduction in meters is likely to require a greater number of field devices to ensure a strong mesh communication network.

5.2.3 Extended or Delayed AMI Deter Deployment

RECO evaluated the implications of an extended or delayed AMI deployment. Citing O&R's 2015 request for proposal process, RECO determined that a full deployment on O&R's planned deployment schedule allowed RECO to take advantage of competitive pricing through volumetric discounts as well as implementation cost-sharing opportunities.

Navigant believes this to be a reasonable assertion for the reasons stated above as well as evidence revealed as part of the evaluation team's cost assessment. One example is the cost of internal labor associated with implementing the AMI IT platform. The team observed a noticeable increase[43] in the allocation of labor costs to RECO following the completion of O&R's AMI project, marking the end of the project cost-sharing opportunity.

[43] Rockland Electric Company 2019 Rate Case: ER19050552 Response to BPU Interrogatories – Worksheet RCR-AMI-5a

6. COMPARISON WITH OTHER AMI BUSINESS CASES

In this section, Navigant compares RECO's top five benefits with PSEG Long Island and Con Edison, two neighboring utilities with successful AMI business case filings. The evaluation team also points out key elements of those successful business cases that are missing from RECO's business case.

6.1 Benefits Comparison

RECO's top five benefit categories are in line with PSEG Long Island and Con Edison's business cases. Key benefits not claimed by RECO include expanded DSM programs such as TOU rates, avoided GHG and pollutant emissions, and avoided costs to customers due to AMI-enabled reliability improvements.

Table 7. Comparison of Benefits with Peer Utility AMI Business Cases

Benefit	RECO	PSEG LI	Con Ed	Duke KY	Notable Differences
Meter Reader Attrition	✔	✔	✔	✔	Con Edison, Duke, and PSEG Long Island's estimates were lower, in part due to transportation and supervisory costs calculated as separate line items. RECO rolled up these indirect benefits into its meter reader hourly rate.
Reduced Outage Costs	✔	✔	✔	✔	Con Edison and PSEG Long Island have similar magnitude; Duke is lower. Mutual assistance savings are missing in RECO's business case.
Reduced Field Service Costs	✔	✔	✔	✔	RECO's magnitude is similar to Duke's. PSEG Long Island and Con Edison calculated transportation and supervisory costs separately from labor. RECO rolled them up in its crew hourly rate.
Avoided Legacy Meter Replacement Costs	✔		✔	✔	
Reduced Bad Debt and Unaccounted for Energy	✔	✔	✔	✔	PSEG Long Island and Con Edison's estimates were higher than RECO's. Duke's was 10 times higher.
Expanded DSM Programs		✔	✔	✔	Missing from RECO's business case.
Avoided GHG and Pollutant Emissions		✔	✔		RECO only counted savings from VVO.
Customer Reliability Improvement		✔			Missing from RECO's business case.

Source: Navigant analysis

6.2 Costs Comparison

Navigant noted minor differences between RECO's CBA and those used for comparison.

Table 8. Comparison of Benefits with Peer Utility AMI Business Cases

Cost	RECO	PSEG LI	Con Ed	Duke KY	Notable Differences
In-Service Meter Replacement Cost Assumption in CBA				✔	DEK included ongoing capital costs (including annual ongoing costs associated with electric meter failure)
Opt-Out Assumption Included in CBA		✔			PSEG LI embedded opt-out assumptions into marketing cost scenarios; Con Ed benchmarked against FPL; Similar to RECO, DEK embedded costs of opt-out into opt-out rate.
Undepreciated Meters Included in CBA	✔			✔	Many PSEG LI legacy meters replaced by AMI to support DOE pilots or due to Super Storm Sandy and did not address the balance of unrecovered meters in its CBA; Con Ed is seeking cost recovery of undepreciated legacy meters but did not include these costs in its CBA.

Source: Navigant analysis

APPENDIX A. ADDITIONAL EVIDENCE SUPPORTING NAVIGANT FINDINGS

A.1 Reduced Meter Reading Costs

RECO's loaded meter reader hourly cost appears higher than peer utility AMI business cases. For example, a New York utility used a meter reader labor cost of $106,819 annually (including salary and fringe benefits) in its successfully approved AMI business case. Using 2,080 hours per year, this translates to an hourly loaded labor cost of $51.36. RECO's annual loaded meter reader cost comes out to $198,370 in comparison. This New York utility claimed supervisory cost reduction, managerial cost reduction, and reduced overtime for field technicians as separate line items from meter reading.

RECO's assumed attrition of nine meter readers is based on "the companies' Meter Reading headcount of 48 applied against RECO's percentage of total meters (17%) which allocates 9 headcount reductions."[44] However, RECO separately reported[45] its "Meter Reader Staffing" as 61 in December 2017. This allocates 10.4 meter readers to RECO, suggesting the attrition of nine is realistic. It is expected that at least one or two meter readers will remain on staff to service opt-out customers.

Navigant attempted to get actual meter reader attrition numbers but was met with the following challenges:

- O&R reported overall attrition of 13 meter readers from December 2017 through March 2019;[46] these savings are shared with RECO's parent company (which is concurrently deploying AMI in New York), making it difficult to allocate savings to RECO. If one were to use the 23.99% operational share of RECO within the parent company, it amounts to approximately 3.1 meter readers (23.99% x 13).
- RECO's quarterly AMI Metrics Reports are silent on meter reader headcount reductions. The Q3 2019 report cites a meter reading reduction of $329,000 in the first three quarters of 2018 versus 2018.[47] It is unclear if this cost reduction is shared with RECO's parent company, and how much is attributed to meter reader payroll attrition.

Navigant's conservative calculation of annual meter reader payroll benefit is $1 million, or about 75% of RECO's reported average annual share of meter reading costs of $1.48 million. This cost reduction is a reasonable expectation with full AMI deployment.

As of September 2019, five meter reader vehicles had been removed from the fleet, and estimated fuel savings based for the third quarter were $4,000.[48]

Navigant notes that its conservative calculation of annual meter reader payroll benefit is $1 million or about 75% of RECO's reported average annual share of meter reading costs of $1.48 million. This cost reduction is a reasonable expectation with full AMI deployment.

RECO's Deferred capital – vehicles ($0.4 million) cost does not appear to include avoided fuel, transportation, and maintenance costs. Deferred meter reading vehicle capital costs are in line with

[44] Rockland Electric Company 2019 Rate Case: ER19050552 Response to Rate Counsel Interrogatories – Set RCR-AMI question 19.

[45] RECO 2019 Rate Case Filing (Exhibit Vol I) Statement in support of adjustment no. 10 to Operation and Maintenance Expenses.

[46] Rockland Electric Company Statement in Support of Adjustment No. 10 to Operations and Maintenance Expenses for the Twelve Months Ended September 30, 2019, To Eliminate AMI Customer Expenses from Test Year. Part of RECO's 2019 Rate Case Filing 2019.

[47] RECO Q3 2019 AMI Metrics Report.

[48] RECO Q3 2019 AMI Metrics Report.

two other peer utility AMI business cases, though supporting assumptions behind RECO's benefit calculation (such as historical and forecasted fleet data) were not provided to Navigant.

Navigant assumes that Itron Maintenance refers to the avoided maintenance or replacements costs of handheld meter reading devices. The evaluation team also assumes that Deferred capital – meter reading system is avoided software subscriptions for meter reading handheld devices. These two benefits appear reasonable and in line with peer utilities, though assumptions behind these calculations are not provided.

A.2 RECO Capital Wage Structure

Navigant used the following RECO-provided capital wage structure in its analysis of loaded hourly rates for meter readers, customer field technicians, electric meter test technicians (third class and first class), and overhead line crews.

Table 9. Descriptions of RECO's Wage Components Used in Analysis

Wage Component	Value		Description
	Meter Readers, Customer Field Technicians, Electric Meter Test Technicians (Third Class and First Class)	Overhead Line Technicians	
1. Direct Wage	Varies	$51.06	Basis of calculation.
2. Indirect Wage	18.1% of direct wage	127% of direct wage	Cost of lost time labor of field personnel due to vacations, holidays, jury duty, sick time, accidents, military, funerals, inclement weather, and other personal reasons.
3. Small Tools	0% of direct wage	7% of direct wage	Cost of small hand tools and work equipment, which are individually small value or reusable on several functions and are of short life.
4. Service Center Overhead	42% of direct wage	103% of direct wage	Costs of building services, telecommunication, transportation, vehicle maintenance and depreciation, and other support services.
5. Supervisory Overhead	99% of direct wage	54% of direct wage	Cost of supervisors of operating departments engaged in field supervision and inspection of construction work, as well as estimation and recording work orders.
6. A&G Overhead	3.3% of sum of 1-5 above	3.3% of sum of 1-5 above	Costs of salaries and expenses of certain general office employees who work on monitoring the capital construction program or maintain records on capital expenditures. (applicable to capital projects only).

Wage Component	Value		Description
	Meter Readers, Customer Field Technicians, Electric Meter Test Technicians (Third Class and First Class)	Overhead Line Technicians	
7. Fringe Benefits	44% of sum of 1-5 above	44% of sum of 1-5 above	Cost of social security, pensions, federal and state unemployment taxes, health insurance (including post-employment benefits and Medicare), and workers' compensation.

Source: RECO

A.2.1 Avoided Outage Restoration Costs

- **False outage dispatch:**
  - RECO reported 343 false outages detected using AMI, saving 343 truck rolls during the third quarter of 2019.[49] RECO's share of these false dispatches is not given, though RECO has a 17% share of O&R meters, coming out to 58 false outages. This may be acceptable considering RECO is working to integrate AMI with its OMS system. Until AMI-OMS integration is complete, tested, and operational, AMI meter pinging is manual and slow, and only a fraction of false outages can be caught in time to prevent a truck roll dispatch.
  - RECO implemented partial AMI-OMS integration (remote meter power status pinging functionality) in September 2018. It is scheduled to implement full AMI-OMS integration into production in the second quarter of 2020[50] (including integration of AMI outage alarms and restoration messages into OMS).
  - RECO's estimate of false outages, 628 annually, was derived by extrapolating from Bergen County to RECO's entire NJ service territory, which accounts for part of Passaic County and Sussex County. This is acceptable.
- **Outage restoration cost savings:**
  - RECO assumed a 0.3% reduction in customer outage minutes through AMI.
  - RECO assumed that customer outage minute reductions will directly translate to crew time savings in a 1:1 ratio.
  - Navigant does not agree with RECO's methodology of deriving crew time savings based on reliability improvement. Navigant considers 0.3% reduction in CAIDI to be conservative. A 5% reduction in CAIDI would be more reasonable. The next step of calculating crew time savings must account for the numbers of customers per outage, which are not available.
  - Navigant assumed a top-down approach of estimated reductions in outage restoration costs. The team assumed a 5% reduction per peer utilities. This yielded a number close to the number derived by RECO using a different approach. Therefore, the magnitude of this benefit is acceptable despite the methodology applied.
- **Customer reliability improvement savings:**
  - RECO has not quantified this benefit in its business case, but it is substantial. Navigant estimated a $13 million benefit over 20 years to RECO's customers from an assumed 5% improvement in CAIDI. This is $6.3 million in NPV terms. A SCT perspective would allow these customer benefits.

[49] RECO Q3 2019 AMI Metrics Report.
[50] RECO Q3 2019 AMI Metrics Report.

- **Mutual assistance cost savings:**
  - These are not explicitly calculated or claimed by RECO in its AMI business case. Navigant assumed a 10% reduction in RECO's average annual mutual assistance costs based on peer utility CBA assumptions, with a time lag of 2-3 years after meter deployment is complete. This suggested about $200,000 in savings in NPV over 20 years.
  - The reason for the time lag is that organization and leadership must gain confidence in AMI storm response capabilities and internalize learnings from multiple storms into their decision-making to request fewer mutual assistance crews ahead of storms.

A.2.2 Reduced Field Costs

RECO reported 645 connects, 822 disconnects, 536 cut outs for non-payment, and 473 cut ins for payment from October 1, 2018 through July 7, 2019.[51] These numbers are in line with the annual estimates projected by RECO.

A.2.3 Reduced Bad Debt/Revenue Protection

- Con Edison AMI business case assumed a 0.25% revenue impact due to avoided theft and tamper, 0.6% meter error, 200% improvement in irregular meter condition. This amounts to $91 million per year for 3.5 million smart meters ($26/meter).
- Duke Energy Kentucky's AMI business case assumed a per-meter revenue improvement from AMI 10 times larger than RECO, attributed to reduced non-technical losses.
- PSEG Long Island assumed a 3% reduction in bad debt.
- FPL assumed a 0.4% revenue impact from reduced non-technical losses (0.25% from avoided theft/tamper, 0.15% from move-in/move-out).
- Ameren Illinois assumed a 0.25% revenue impact from reduced theft/tamper.
- Connecticut Light & Power assumed a 0.4% revenue impact from reduced theft/tamper.
- National Grid assumed 0.25% in its AMI business case.

[51] Rockland Electric Company 2019 Rate Case: ER19050552 Response to BPU Interrogatories – Set RCR-AMI question 12.

APPENDIX B. ADDITIONAL DOCUMENTS REVIEWED

Rockland Electric Company 2019 Rate Case: ER19050552 Response to BPU Interrogatories with Supporting Worksheets	
RCR-AMI-1	
RCR-AMI-2	
RCR-AMI-3	
RCR-AMI-4	
RCR-AMI-5	
RCR-AMI-6	
RCR-AMI-7	
RCR-AMI-8	
RCR-AMI-8ab	
RCR-AMI-9	
RCR-AMI-10	
RCR-AMI-11	
RCR-AMI-12	
RCR-AMI-13	
RCR-AMI-14	
RCR-AMI-15	
RCR-AMI-15 (Revised)	RCR-AMI-16 - Worksheet
RCR-AMI-16	
RCR-AMI-16 (Revised)	RCR-AMI-16 FACB Model
RCR-AMI-17	
RCR-AMI-18	
RCR-AMI-19	
RCR-AMI-20	
RCR-AMI-21	
RCR-AMI-22	
RCR-AMI-23	
RCR-AMI-24	
RCR-AMI-25	
RCR-AMI-26	
RCR-AMI-27	
RCR-AMI-28	
RCR-AMI-29	
RCR-AMI-31	
RCR-AMI-32	
RCR-AMI-33	
RCR-AMI-31	
RCR-AMI-32	RCR_AMI_Attachment_32_E (Worksheets)
RCR-AMI-34	
RCR-AMI-35	
RCR-AMI-36	

Rockland Electric Company 2019 Rate Case: ER19050552 Response to BPU Interrogatories with Supporting Worksheets	
RCR-AMI-37	
RCR-AMI-38	
RCR-AMI-39	
RCR-AMI-40	
RCR-AMI-41	
RCR-AMI-42	
RCR-AMI-43	
RCR-AMI-44	
RCR-AMI-45	
RCR-AMI-46	RCR-AMI-46 - Worksheet
RCR-AMI-47	RCR-AMI-47 - Worksheet
RCR-AMI-48	
RCR-AMI-49	
RCR-AMI-50	
RCR-AMI-51	
RCR-AMI-52	
RCR-AMI-53	
RCR-AMI-54	
RCR-AMI-55	
RCR-AMI-56	
RCR-AMI-57	
RCR-AMI-58	
RCR-AMI-59	
RCR-AMI-60	
RCR-AMI-61	
RCR-AMI-62	
RCR-AMI-63	
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RCR-AMI-65	
RCR-AMI-66	
RCR-AMI-67	
RCR-AMI-68	
RCR-AMI-69	
RCR-AMI-70	
RCR-AMI-71	
RCR-AMI-72	
RCR-AMI-73	
RCR-AMI-74	
AMI-27	
AMI-27 (revised)	
IR RECO REV 60	
RCR-A- 36	

Rockland Electric Company 2019 Rate Case: ER19050552 Response to BPU Interrogatories with Supporting Worksheets	
RCR-A-60 (revised)	
RCR-A-109	RCR-A-109 Attachment 1
RCR-CI-71	
RCR-CI-72	
RCR-DEP-INF	
RCR-ENG	
RCR-ENG-64	
S-RECO-ENG-9	
S-RECO-ENG-15	
S-RECO-ENG-16	
S-RECO-ENG-17	
S-RECO-ENG-18	
S-RECO-ENG-20	
S-RECO-REV-45	S-RECO-REV-45-Attachment
S-RECO-REV-60	
S-RECO-REV-72	

Rockland Electric Company 2019 Rate Case; BPU Docket No.: ER19050552 Rate Counsel Testimony
Direct Testimony of Susan M. Baldwin (10/11/2019)
Direct Testimony of Paul J. Alvarez (10/11/2019)
Direct Testimony of Andrea Crane (10/11/2019)

Rockland Electric Company 2016 Petition for Approval of an Advanced Metering Program; BPU Docket No.: ER16060524 Response to BPU Interrogatories
RCR-AMI-16
RCR-AMI-17
RCR-AMI-19

Rockland Electric Company 2016 Petition for Approval of an Advanced Metering Program; BPU Docket No.: ER16060524 Rate Counsel Testimony
Division of Rate Counsel's Reply Brief (4/26/17)
Division of Rate Counsel's Initial Brief (4/7/17)
Direct Testimony of Tim Woolf (9/9/16)