

Smart Grid Advanced Metering Annual Implementation Progress Report

Appendix B

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Analysis of Accelerated Deployment Schedules

I. INTRODUCTION AND SUMMARY

Pursuant to the Illinois Commerce Commission’s (“ICC” or “Commission”) December 5, 2012 Order on Rehearing in ICC Docket No. 12-0298, Commonwealth Edison Company (“ComEd”) worked to evaluate options for accelerating the deployment of AMI meters sooner than the current planned installation commencement date of January 2015. ComEd analyzed both operational and financial factors. As explained below, ComEd also developed and analyzed two primary alternative scenarios. First, ComEd analyzed the accelerated deployment scenario proposed by Commission Staff (“Staff”) in the briefing stage of ICC Docket No. 12-0298 on rehearing (“Staff Alternative”), calling for AMI meter deployments beginning in 2013. After considering operational issues, ComEd determined that an additional alternative could be based on the Staff Alternative, but with modest modification that maintained the same start date and quantity of 2013 installations, and adjusted yearly installation totals in 2014 and beyond, to accommodate operational issues. ComEd then analyzed this alternative accelerated deployment scenario (“Staff Alternative – Adjusted”) as well.

The Staff Alternative provides a solid foundation which allows for Project evaluation and refinement. ComEd appreciates Staff’s effort to develop an accelerated deployment schedule that considers operational limitations. From an operational perspective, the Staff alternative is feasible but not optimal. ComEd has thoroughly evaluated the Staff Alternative and has identified several areas for improvement that takes into account ComEd operational details. Both accelerated deployment scenarios would achieve by 2018 the cumulative AMI meter deployment level that was originally proposed in the April 23, 2012 AMI Plan. Indeed, the Staff Alternative – Adjusted scenario achieves this level of deployment slightly earlier in 2018 than the Staff Alternative scenario. In addition, Staff Alternative – Adjusted is operationally preferable to the original Staff Alternative because of more efficient labor utilization associated with the annual deployment counts, and its alignment with the Meter Data Management System (“MDMS”) capacity. Hence, ComEd does not recommend the Staff Alternative but prefers the Staff Alternative – Adjusted.

Both accelerated deployment scenarios require significant additional capital expenditures in the near term above and beyond the amounts budgeted for that purpose. As explained below, the financial expectations upon which ComEd developed its original AMI meter deployment schedule have changed as a result of the uncertainty in the regulatory process encountered during 2102, which is still unresolved, and its continued impacts on the ability to recover the costs of investments. Nor would it be prudent or reasonable for ComEd to further leverage its capital structure by borrowing additional funds for that purpose. As a result, ComEd does not have the resources to provide additional funds to AMI meter deployment over the next two years.

II. KEY OPERATIONAL CONSIDERATIONS

As noted above, the current AMI Plan calls for new AMI meter deployments commencing in January, 2015. The deployment of AMI meters across ComEd’s service territory is a significant

undertaking that requires appropriate resources to be in place, and must be closely aligned with IT system and functionality workstreams that are critical to operational benefit realization and mitigation of deployment risks. The operational factors relating to Field Deployment, the MDMS capacity, and the prioritization of AMI functionality delivery are integral to the deployment of meters regardless of scenario, and have been analyzed by ComEd in considering options to accelerate deployment as discussed below.

A. Field Deployment

The AMI Deployment team is currently responsible for strategy development and ongoing planning activities to prepare for the large-scale deployment of AMI meters throughout the service territory. The four main considerations impacting field deployment include: (1) the mobilization of meter installation labor; (2) the peak number of annual meter installations; (3) the duration of the peak meter installation level; and (4) the demobilization of meter installation labor.

- *Meter Installation Labor Mobilization:* Due to the large size of the deployment and the significant impact it will have on ComEd operations, adequate time and ramp-up of effort is required to effectively mobilize the installation labor force. This labor force includes management and meter installation labor, and is estimated to peak at 150 to 180 workers, depending on the deployment scenario. The mobilization steps include posting open positions, recruiting resources, completing background checks, testing and assessing candidates, completing interviews, and extending offers. Training and onboarding of the new employees is then required to prepare them for the technical and safety-related elements of the work they will be performing. Once the initial employees are in place, a reasonable period of time is required to enable the growth of the installation staff and allow for adjustments with minimal rework and inefficiencies, while maintaining a stable and qualified staff. The monthly rate of installation volume for deployment would subsequently ramp-up in alignment with the growth, development, and productivity of the installation staff.
- *Peak Installation Level:* The peak annual number of meter installations dictates the size of the organization needed to accomplish that volume, making it an important consideration for the development of a meter deployment plan. As the number of meters installed in a given year increases, so do the challenges associated with deployment. Such challenges include recruiting, training, supervising, and maintaining a larger meter installation team. The risks associated with these challenges include reduced productivity and overall quality, required re-work, and the potential for safety-related incidents.
- *Duration of Peak Installation Level:* Extending the duration of the peak period of installations influences the stability of the meter installation team. A consistent deployment volume over a longer period of time would help to attract and retain a reliable, productive, and high-quality team, resulting in a cost-effective and safe deployment process that minimizes the potential for installation errors. This would apply for both back office and field work.

- *Meter Installation Labor Demobilization:* A managed and orderly demobilization of all elements of the deployment is required over a reasonable amount of time. By stopping the large-scale deployment effort immediately following its highest levels of expected productivity, risks related to meter installation labor management would be introduced. These risks include the ability to retain trained and experienced employees through the duration of the deployment and the ability to re-assign those employees to other positions in the organization upon completion.

B. Meter Data Management System

The current MDMS installed during the AMI Pilot introduces two operational considerations impacting meter deployment: (1) the duration required to complete the replacement, and (2) the capacity for more meters within the existing system until the system is replaced. As described in the Revised AMI Plan, ComEd will be installing a new MDMS as part of its full deployment of AMI meters. Until this work is completed, 270,000 AMI meters can be installed in addition to the existing 130,000 meters in the pilot footprint (400,000 total meters), for management by the current MDMS without adverse impact to system performance

The replacement of the current MDMS will require a lengthy and complex work stream completed by the IT and Business Transformation (“BT”) teams. The MDMS replacement will require a 15-month time period to complete, and is currently scheduled to start in the third quarter of 2013 and finish in the fourth quarter of 2014. New meter installations cannot occur during the final 2 months of this work stream when AMI meters are switched over from the existing to the new MDMS.

This work will result in the implementation of a new system that will be sized for full deployment. The timeline is representative of the required mobilization of staffing for IT, the technical work and system testing that is required for completion, as well as the supporting business process redesign and change management work required to implement and utilize the new MDMS.

ComEd considered upgrading the current MDMS to allow for more AMI meters to be installed sooner. However, this option would lead to minimal acceleration of meter deployment due to the timeline of work associated with the upgrade (estimated to be 9-12 months), and would also cause wasteful IT spending that would not help to enable future operational benefits. Additionally, it would not be an effective utilization of the experienced and qualified IT professionals that would be required to work on a temporary solution. Ultimately, it was concluded that an advancement of the current meter deployment schedule could be accomplished in 2013 and 2014 without pursuing an upgrade of the current MDMS.

Prudent AMI meter deployment volumes should be consistent with the volume limitations of the current MDMS, the schedule for MDMS replacement, and allow for reasonable contingency for unanticipated delays or technical complexities.

C. Prioritization of AMI Functionality Delivery

While reviewing potential meter deployment scenarios to develop the current deployment schedule, ComEd explored whether it would be more beneficial to place a higher priority on deploying meters as quickly as possible (“Meters First”), or to prioritize the implementation of the technologies, tools, functionality, and business processes that would support the future end state AMI system (“Functionality First”). These scenarios were reviewed in the context of (1) operational benefit realization, (2) risk of re-work, and (3) timing of access to interval data by customers. After completing an assessment of both deployment scenario options, it was determined that the “Functionality First” approach to AMI deployment would be best for the reasons described below.

In a “Meters First” deployment scenario, the capital spend available would be allocated to meter purchases and installation. If such a scenario were adopted, the resulting deployment acceleration would be minor (estimated to be less than 30,000 meters), and the delays in IT and business activities required to allow for quicker meter deployment would subsequently reduce the number of meters that could be deployed in 2015 by roughly the same amount.

As noted, the timeline for operational benefit realization is a key component of the overall value of the project to ComEd and its customers. If a “Meters First” deployment scenario were chosen for deployment, the delivery of supporting system functionality and business processes that enable benefit realization would be delayed. These operational benefit delays would be most impactful to the anticipated savings from reduced manual meter reading, reductions in unaccounted for energy (UFE), reductions in consumption on inactive meters (CIM), and decreased levels of bad debt. Moving up the timeline for meter installation does not, on its own, drive increased operational benefits for ComEd or its customers.

By selecting a “Functionality First” meter deployment scenario, the design and build-out of IT systems and new business processes will be completed prior to meter installation, to the extent possible, in order to handle higher annual volumes of meter exchanges while reducing the risk of manually-handled work exceptions. With this approach, a number of operational risks would be avoided, including the need for subsequent field visits to already installed AMI meters. Such operational risks are heightened in direct proportion to the number of meters deployed in parallel to the replacement of the MDMS, and would result in further cost overruns and inefficient utilization of resources.

A key element of AMI functionality is the delivery of interval energy usage data to customers on a daily basis. This data enables customers to proactively manage their energy usage and monthly bills, and is currently available to customers with an AMI meter. Under a “Meters First” approach, more customers would receive AMI meters sooner, thereby enabling them to utilize the AMI meter’s ability to measure and store interval energy usage data. However, this factor was deemed to be less impactful than the resulting delay in operational benefit realization and the risk of re-work.



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As a result of the foregoing analysis, ComEd does not consider a “Meters First” scenario to be a prudent or effective means to accelerate deployment. Thus, all scenarios considered by ComEd for acceleration reflect a “Functionality First” approach.

III. DEPLOYMENT SCENARIO ANALYSIS

The following section outlines the analysis conducted for meter deployment scenarios. Three scenarios were reviewed in the context of the operational considerations outlined in section II of this document. The following table represents the annual meter installation counts for each of the three scenarios:

(000's)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Current Revised AMI Plan	0	0	0	500	846	846	700	485	377	275
Staff Alternative	0	60	250	500	846	846	600	385	300	242
Staff Alternative – Adjusted	0	60	160	680	770	770	770	275	275	269

A. Current AMI Plan: 2015 Meter Deployment

As discussed, unexpected revenue reductions caused ComEd to re-plan the AMI deployment, ultimately resulting in a deferral of meter installation until January of 2015. Once the available funding was determined, the current deployment schedule was created based on the guiding principles for operations, including the impact on field meter deployment, the MDMS, and the prioritization of AMI functionality delivery.

1. Field Deployment

One of the key considerations from a field deployment perspective is the mobilization period required prior to meter deployment. In the current AMI Plan, appropriate time is built-in for the ramp-up of resources during the end of 2014 and beginning of 2015. During this time, the management and meter installation labor will be acquired and integrated into the organization in an efficient manner. Additionally, during 2015, the rate of meter deployment will gradually increase, eventually reaching full capacity levels leading into 2016.

The current AMI deployment scenario was also created with the peak annual meter deployment count in mind. The peak of 846,000 meters planned for in 2016 and 2017 is larger than any year in the originally filed plan, and is not operationally ideal. However, based on ComEd’s experience and managerial judgment, along with lessons learned from other similarly sized deployments, this deployment target is deemed to be reasonable and manageable from a risk perspective.

The duration of the peak period was also a consideration in the development of the current AMI deployment scenario. In the current plan, ComEd will be deploying meters at peak capacity during the fourth quarter of 2015 through the third quarter of 2018. This prolonged level of full-capacity deployment will result in a predictable and efficient deployment process, enabling ComEd to attract and retain a stable and reliable work force.



Lastly, the demobilization of the deployment effort was considered during the creation of the current AMI deployment scenario. The demobilization will take place beginning in the fourth quarter of 2018 and continue through the end of deployment in 2021, with declining annual meter counts during the demobilization period. This time period will reduce the risks to retaining trained and experienced employees and the organizational inefficiency resulting from a more sudden end to meter deployment, leading to a stranded labor force or more prolonged period to re-assign the labor force.

2. MDMS

The timing for the MDMS replacement effort was an important consideration in the design of the current AMI deployment scenario. The plan calls for the completion of the MDMS replacement by the end of 2014, prior to the commencement of meter deployment in January 2015. Having the MDMS replaced during this timeframe (i.e., ahead of any additional meter installations) reduces the risk of required re-work during meter deployment. Additionally, the 2-month system down-time required to switch over to the new MDMS system would not occur during the meter deployment period, thereby eliminating the labor management complexity associated with starting and stopping the deployment effort.

Lastly, as a result of starting meter deployment in 2015, the planning and technical architectural design work that was previously planned to be done in parallel to MDMS replacement can now be completed prior to MDMS replacement. This timeline and sequence of tasks allows for more prudent planning and technical flexibility, making it more optimal.

3. Prioritization of AMI Functionality Delivery

As indicated in the timing of MDMS replacement, the overall delivery of AMI functionality takes priority over the immediate installation of meters in the current AMI deployment scenario. While the Revised AMI Plan calls for the deployment of meters to commence in January, 2015, IT and Business Transformation work will continue throughout 2013 and 2014 to develop, design, and deliver the enhanced IT systems and redesigned business processes that will be the foundation for future state AMI operations. Under this scenario, the next phase of functionality and prioritized business processes would be completed prior to the commencement of meter deployment, driving operational benefit realization in the areas of manual meter reading, Unaccounted For Energy, Consumption on Inactive Meters, and Bad Debt. Additionally, by not deploying meters in parallel to initial functionality delivery, the risk of manually-handled work exceptions and the need for subsequent field visits to already installed AMI meters would be avoided.

B. Staff Alternative

In response to the 2015 deployment scenario that ComEd proposed during rehearing in ICC Docket No. 12-0298, Staff provided an adjusted meter count scenario for consideration in its Initial Brief on Rehearing. This scenario was a response to ComEd's critique outlining the operational challenges presented by Staff witness Dr. Schlaf's guidelines for an accelerated deployment schedule. This revised Staff deployment scenario accounted for the mobilization



and demobilization of deployment that ComEd stated would lead to staffing inefficiencies, and included proposed annual meter counts consistent with the limitations of the current MDMS.

After reviewing the scenario proposed by Staff in the context of the operational considerations noted in Section II above, ComEd has determined that the Staff Alternative is operationally feasible, though not optimal. While ComEd has determined that the Staff Alternative deployment scenario is feasible from an operational perspective, it requires additional funding over the next several years in order to implement. An adjusted version of the deployment rollout is described in Section III.C. An analysis of the operational characteristics of the Staff Alternative is described below.

1. Field Deployment

In the Staff Alternative, some time for mobilization of resources is available to acquire and integrate the management and meter deployment labor into the organization. However, the 250,000 meter count in 2014 puts additional strain on the labor planning effort on the front-end, as there are only ten months of availability for deployment in 2014. The existence of the 2-month period of time when meters cannot be deployed adds to the complexity of the labor strategy and execution. Such a delay will lead to lost continuity with the meter installation team, and the need to find suitable work for those resources to fill the 2-month gap.

In terms of peak annual meter deployment count, the Staff Alternative, similar to the current meter deployment scenario, peaks at 846,000 meters in 2016 and 2017. This deployment target is deemed to be reasonable and manageable from a risk perspective, as previously discussed.

The duration of the peak period for the Staff Alternative is also similar to the current AMI meter deployment scenario. In both scenarios, ComEd will be deploying meters at peak capacity during the fourth quarter of 2015 through a portion of 2018, though peak deployment rates would end roughly one quarter sooner in the Staff Alternative. This makes the Staff Alternative slightly less desirable from an operational standpoint, when compared to the current AMI meter deployment schedule.

From a demobilization perspective, the Staff Alternative would lead to reduced deployment levels starting sooner than the current AMI meter deployment scenario by roughly one quarter. This extended time period for demobilization will limit the deployment risks and inefficiencies associated with a more sudden stop to deployment, more so than the current AMI meter deployment scenario would. However, the fact that the meter installations decline over the last three years is not ideal because it would require adjustments to staffing every year for the last three years of the program, causing disruption to workforce planning, retention, and training.

2. MDMS

The Staff Alternative calls for meter deployment to begin in 2013 while the MDMS replacement work is in progress. Based on the proposed annual deployment counts, the meter count capacity limit of the existing MDMS would be reached just as the new MDMS is implemented. Delays in the MDMS replacement or the identification of additional complexities could cause these two

critical paths to conflict, leading to added difficulties to the labor strategy, and required re-work. Therefore, the proposed annual deployment count for 2014 in the Staff Alternative leads to operational and technical risks not found in the current AMI deployment scenario.

Lastly, as with the current 2015 Deployment scenario, technical architectural design work will be completed prior to the MDMS replacement rather than in parallel to it. This timeline and sequence of tasks allows for more prudent planning and technical flexibility, making it more optimal.

3. Prioritization of AMI Functionality Delivery

With the Staff Alternative, initial functionality (including the new MDMS) will be delivered in parallel to meter deployment, which is not operationally ideal. By deploying meters sooner, the desired operational benefits are not accelerated because they are dependent upon delivery of the underlying functionality. Additionally, the number of meters deployed during the initial delivery period would be approximately 270,000, introducing the potential for technical complexity and re-work. This includes the potential of a higher volume of manually-handled work exceptions related to meters that were deployed prior to functionality delivery. Such operational risks and inefficiencies will lead to a more unpredictable deployment under the Staff Alternative, particularly in the early years. However, by deploying meters sooner, more ComEd customers would have AMI meters, allowing them to access online interval energy usage data to more effectively manage their energy usage.

C. Staff Alternative – Adjusted

While the Staff Alternative scenario was deemed to be operationally feasible, ComEd further adjusted the scenario to optimize operational efficiencies. These adjustments are described below, in the context of the key operational considerations previously noted: (1) Field Deployment, (2) MDMS, and (3) the prioritization of AMI functionality delivery.

1. Field Deployment

In the Staff Alternative – Adjusted scenario, the number of meters installed in 2014 is reduced to 160,000 from the 250,000 called for in the Staff Alternative. This adjustment from the Staff Alternative drives a reduction in meter installation labor of roughly 15 FTEs during the year, which reduces the complexity of the associated labor strategy. ComEd can more effectively find suitable work during the 2-month hiatus period for the number of resources required under the Staff Alternative – Adjusted scenario than in the Staff Alternative.

Another notable adjustment from the Staff Alternative is the reduction of the peak annual number of installations from 846,000 to 770,000. This reduction in peak annual meter installations will address challenges related to recruiting, training, supervising, and maintaining a larger meter installation team. It will also help to mitigate the risks associated with these challenges including reduced productivity and overall quality, required re-work, and the potential for safety-related incidents.

In addition to reducing the peak, the Staff Alternative – Adjusted scenario also extends the duration of the peak period of installation. In the Staff Alternative, the peak period runs from the fourth quarter of 2015 through the first half of 2018. The meter count changes reflected in the Staff Alternative – Adjusted scenario extend the peak from the third quarter of 2015 through the end of 2018. By extending the peak by nearly one year, the recruitment and retention of a stable meter deployment team is expected to be enhanced.

From a demobilization perspective, the Staff Alternative – Adjusted scenario is more ideal when compared to the Staff Alternative and the Revised AMI Plan deployment schedules. It levels meter installations over the last three years of the program, maintaining a trained and stable workforce of approximately the same size that will be required for ongoing maintenance activities once all meters are installed. In contrast, the Staff Alternative would require adjustments to staffing every year for the last three years of the program, causing disruption to workforce planning, retention, and training.

2. MDMS

As with the Staff Alternative, the Staff Alternative – Adjusted scenario calls for meter deployment to begin in 2013 while the MDMS replacement work is in progress. However, the number of meters that would be installed during that time period is decreased by 90,000 meters in the Staff Alternative – Adjusted scenario. This reduction mitigates the risks associated with reaching the capacity limit of the existing MDMS during deployment, thereby reducing the amount of potential re-work and added complexity for managing the labor through the 2-month meter deployment delay required in 2014 for MDMS go-live. Additionally, by reducing the number of meters deployed during 2014, the schedule allows more flexibility to develop an appropriate response to unanticipated project delays or system complexities. Lastly, as with the current 2015 Deployment scenario, and the Staff Alternative, the sequencing of the technical architectural design and the MDMS replacement is completed in sequence, rather than in parallel.

3. Prioritization of AMI Functionality Delivery

Similar to the Staff Alternative, the Staff Alternative – Adjusted scenario also does not drive an acceleration of operational benefit realization. However, it does limit the risk of completing overall delivery of AMI functionality in parallel to meter deployment when compared to the Staff Alternative. In the Staff Alternative – Adjusted scenario, the number of meters deployed during the initial functionality delivery period (including MDMS replacement) is reduced by 90,000. This reduction limits the potential for a high volume of manually-handled work exceptions as well as other inefficiencies that would drive a more unpredictable deployment. As with the Staff Alternative, in the Staff Alternative – Adjusted scenario more ComEd customers would have AMI meters sooner than under the Revised AMI Plan, allowing them to access online interval energy usage data to more effectively manage their energy usage.

IV. FINANCIAL AND RESOURCE CONSTRAINTS

Any deployment of a significant number of AMI meters, regardless of the schedule on which that deployment occurs, creates a significant demand for investment capital. Whether ComEd has the available capital for meter deployment in any given year depends heavily, in turn, on its revenues and on its other capital obligations. Those capital obligations include baseline investment needs of the type that preceded EIMA (*e.g.*, demands of public relocation projects, capacity additions to meet planning criteria, summer critical reinforcements) as well as other obligations under EIMA including obligations with shorter time horizons than AMI deployment. ComEd's ability to recover funds through rates also directly affects capital availability, especially because ComEd is not in a position to be able to prudently fund long-term investments through borrowing (again absent revenue increases). Obtaining additional funds solely through debt would not be prudent or reasonable as additional leverage would impair ComEd's financial flexibility and strength, and would further leverage ComEd's capital structure. Fundamentally, borrowing is not a prudent response to a revenue deficiency driven capital constraint.

ComEd has always proposed AMI deployment schedules that it believed were practicable when proposed. However, since the passage of EIMA, factors affecting the viability of these schedules have changed. Importantly, the level of revenues and, thus, the amount of capital that is now – and will be – available for incremental investment has fallen well below the levels that ComEd anticipated in early 2012. Much of this shortfall relates to certain rulings by the Commission in ComEd's formula rate case proceedings that have resulted in significant reductions to ComEd's revenue over its planning horizon, and corresponding reductions in available capital. Because AMI meter deployment requires additional capital, this constraint has directly affected ComEd's ability to deploy AMI meters and the speed at which that deployment can occur.

Under the Staff Alternative deployment schedule, ComEd would be required to expend approximately \$40 million of additional investment capital in each of 2013 and 2014. Under the Staff Alternative – Adjusted schedule, ComEd would be required to expend approximately \$35 million of additional investment capital in each of 2013 and 2014. We understand that the Staff Alternative – Adjusted is preferable to the original Staff Alternative for operational reasons, and the Staff Alternative – Adjusted scenario also requires less capital expenditure through 2014. Nevertheless, either scenario requires capital resources that are not available to ComEd under current circumstances and, thus, neither is practicable absent a material increase in ComEd's revenues.

V. CONCLUSION OF ANALYSIS

Based on an evaluation of scenarios both operationally and financially, the Staff Alternative – Adjusted is the superior potential acceleration options for customers and ComEd. However, as with other acceleration scenarios, including the basic Staff Alternative, the Staff Alternative – Adjusted cannot be implemented without additional funding over the next several years. In the event that the required additional funding was provided by June of this year, as is proposed in currently pending legislation, Staff Alternative – Adjusted could be placed in motion.