

Smart Grid in Motion*

By Sabrina Geary, CPS Energy and Mark Hatfield, Enspira Solutions, Inc.

THE PACE OF CHANGE WITHIN THE ADVANCED METERING INFRASTRUCTURE LANDSCAPE IS RAPID. The core technology vendors in advanced metering infrastructure (AMI) and meter data management systems (MDMS) are releasing new functionality approximately twice a year. As a result, the vendors that utilities rely on for technology such as customer information systems (CIS) and outage management systems (OMS) are making changes in response to new AMI

developments, and any project must stay in tune with the support model. Nascent technologies are important to the AMI vision; demand response, customer presentment and in-home displays are rapidly evolving too.

As applications evolve, a utility is faced with the challenge of keeping the data flowing and the processes ongoing.

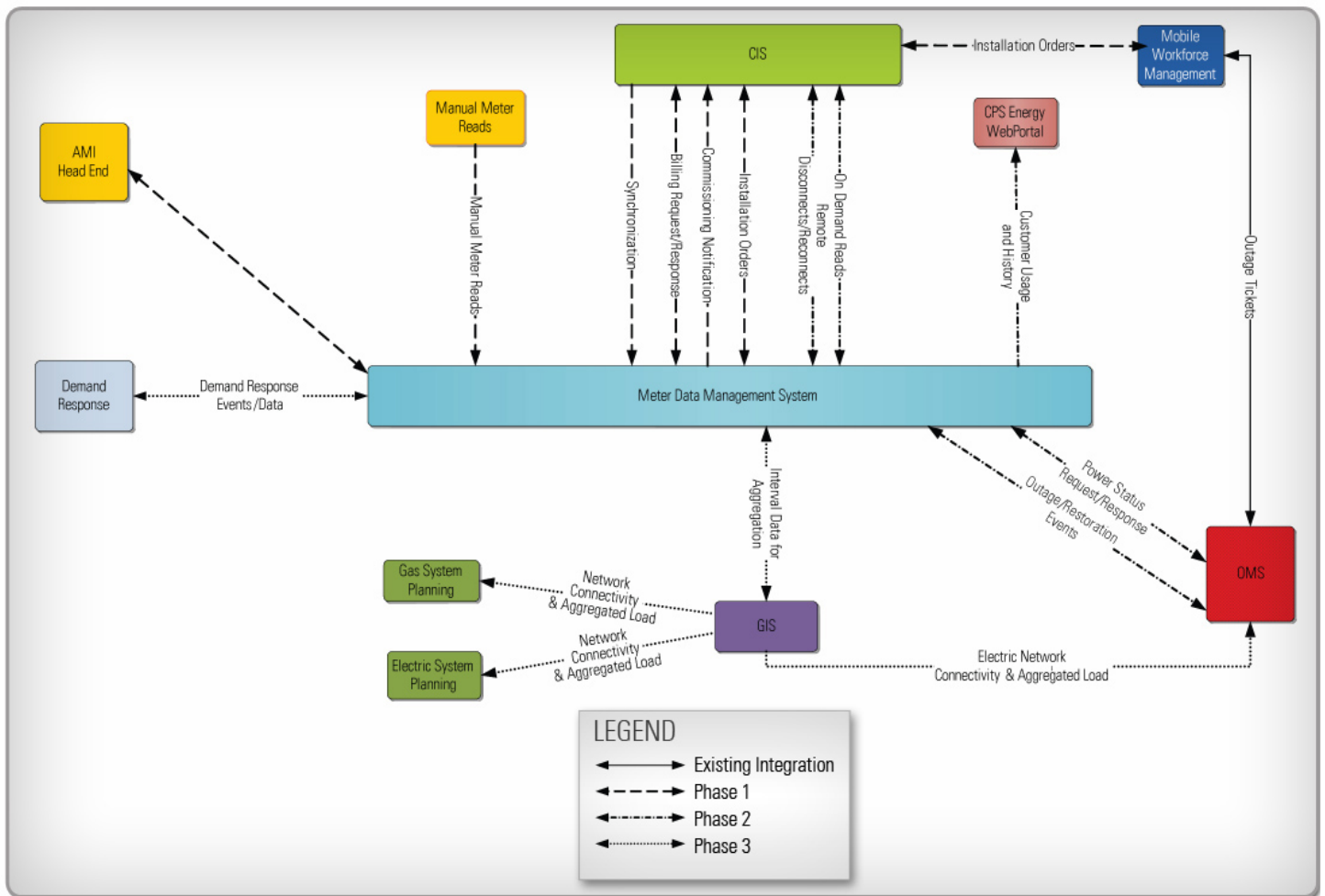


Figure 1. CPS MDMS Application Architecture Overview

But the target of an overall AMI project is set — it is the business case. With the public and internal scrutiny of AMI projects, utilities must achieve the benefits identified in the business case within the cost constraints of the project. AMI and MDMS are the technology foundation that provides the promise of achieving the business benefits. It is the responsibility of the system design and the overall system integration to deliver the data to the utility's core systems and business processes so the benefits can be realized. But it is this system design that is pushed, pulled and bounced by all the moving pieces. So, system integration in AMI projects is like hitting a stationary target while moving.

PROJECT OVERVIEW

CPS Energy (San Antonio, Texas, U.S.) is one of the nation's largest municipally owned energy companies providing both natural gas and electric service. CPS Energy serves approximately 690,000 electric customers and almost 320,000 natural gas customers in and around the seventh-largest city in the nation.

CPS Energy is planning on replacing existing electric meters and gas modules with AMI technology over the next five years through a three-phase project. The installation will be done with internal resources. CPS Energy also will install a MDMS, with the required integrations to existing and future information systems, to achieve the desired business benefits.

MOVING PIECES

In early 2009, CPS Energy began the system design phase of the project. Because of the work put into the business case, the desired end state of the project is clear. CPS Energy knows what must be accomplished financially

and the targeted benefit areas to achieve success. The challenge of the system design is to translate the benefit areas into the specific integrations and core business changes necessary to achieve these results. However, this translation is complicated by the incredible number of moving pieces over the three phases of the project that must be brought together into the overall system design. Following are some of the major moving pieces:

- Scheduling product enhancements to the CIS to provide some of the required functionality for phases one and two
- Updating AMI and MDMS version releases (approximately two per year)
- Coordinating a mobile workforce management (MWM) system upgrade required to provide the functionality needed by CPS Energy field installation teams
- Determining blackout dates for changes to call center processes during the peak summer months
- Working with the OMS vendor, who is transitioning its product from OMS to distribution management system (DMS) functionality, and proceeding with the designs to integrate AMI functionality in parallel with CPS Energy's designs.

Of all the moving pieces, the CIS product enhancements were the most difficult to assess. The first principle in the project is not to break the meter-to-cash process. CPS Energy is also trying to stay with an off-the shelf CIS solution as much as possible. However, the planned CIS product enhancements were not going to meet all of CPS Energy's requirements and were not in sync with the project schedule. Therefore, CPS Energy faced the decision of having to make all the customizations to support phases one and two, or to add some customizations on



Table 1. CPS Energy AMI Project by Phase

Project phase	Objective	Functionality
Phase 1	Integrate AMI head end, MDMS, CIS, GIS and MWM	<ul style="list-style-type: none"> - Install AMI meters - Provision and commission meters in the system - Enable billing of AMI meters
Phase 2	Deliver the real-time functionality of the AMI system to CPS Energy business processes	<ul style="list-style-type: none"> - Provide remote disconnect/reconnect functionality to CIS business processes. - Integrate AMI functionality into OMS outage prediction and restoration processes
Phase 3	Integrate AMI with demand response, DMS and gas/electric system planning	<ul style="list-style-type: none"> - Integrate AMI capabilities into CPS Energy's evolving demand-response program - Provide AMI data to gas/electric system planning - Integrate AMI capabilities into DMS and smart grid initiatives

top of the product upgrades. Risk evaluations determined the latter option had the greatest risk to successfully completing phases one and two; therefore, the customization path was selected.

The second-largest challenge was coordinating AMI and MDMS vendor upgrade schedules into the design. The project will use product interfaces between the AMI and MDM vendors. With the AMI vendor upgrading product adapters to provide access to new functionality, the MDMS vendor development lags that of the AMI vendor; therefore, product releases rarely occur at the same time. System designs need to ensure that required functionality by phase is available in the planned vendor release dates.

Then there are the parts that are moving but with much- less-certain paths. For example, the demand-response industry is in its nascent stage with new and existing vendors working to define how they will work together in the recruitment, enrollment, execution and monitoring life cycle. Vendors are also defining

how AMI data will be used to support enhanced system planning and on-line power flow. At the same time, CPS Energy is working to define its own strategies in these areas. Designs for the third phase need to provide enough detail to give company leaders confidence that future benefits can be achieved while allowing flexibility to adjust to the unknown changes in the industry.

PEOPLE MOVE TOO

A utility's culture is firmly planted in the conventional meter world. The staff deals with monthly register reads for the vast majority of customers and handles change-of-account activities by sending technicians to the meter. The few staff with experience with "the new way" are limited to the commercial and industrial accounts.

While people are eager to learn and adapt to AMI technology, it is still a mind-expanding experience for the staff to grasp the future world of interval data and the mass residential

customers' remote access to the meter. The entire project team spent significant effort with personnel throughout the design phase to educate them as to what AMI technology can do for the business and what CPS Energy needs it to do to accomplish the business case.

THE REALITY OF TIME

Not all functionality will be deployed on day one of the project. CPS Energy learned to accept that the designs of the future phases could not be completed to the same level of detail as required for phase one. The system design needed to define the foundation of what would be necessary for each phase, but still allow the flexibility to adapt to the changes CPS Energy knows are coming.

CPS Energy was able to corral all of the moving pieces and resolve all the schedule and delivery constraints to identify a second-quarter 2010 go-live date that provides contingency in the event of unforeseen schedule delays. CPS Energy has solid designs for phase one that will meet the business objectives of that phase and fall within the cost constraints of the project.

With phase two being further out, CPS Energy has solid business requirements, preliminary designs and cost estimates. During the first phase, the utility will monitor vendor progress for functional releases necessary for phase two to assess the overall risk. CPS Energy will finalize designs, incorporating final vendor designs, prior to the start of phase two.

The ultimate success of phase three depends on the continued growth of vendor capabilities in demand response, system planning and on-line power-flow analysis for OMS/DMS. For phase three, CPS Energy has a cushion of time to track changes in the industry and continue to refine

requirements, architecture and design during the first two phases of the project.

LESSONS LEARNED

As CPS Energy has moved through the system design of the AMI project, the complexities of keeping track of and evaluating the impacts of so many moving pieces has probably been the most difficult portion of the design process. As the utility has moved through this process, the needs for strong program management and system integration methodologies have been reinforced. Other key lessons that have been reinforced during the design are as follows:

- Project risk mitigation methodologies are key to success. With so many moving pieces, risks and contingencies must be considered from day one of the project.
- Strong working relationships with vendors are essential. With dependencies on future vendor product releases, close communications with vendors is essential and must be incorporated into risk assessments.
- With so many moving pieces, tying decisions back to the business case is the constant frame of reference for project decisions. When pushing business processes into uncomfortable new directions for the organization, people will ask why. Understanding the link to the business case helps the users understand the reason for the changes. CPS Energy also built a Benefits Traceability Matrix linking requirements to the business case. This helped identify scope creep in the project.
- A flexible system integration approach is essential to reduce the friction among so many moving parts. The overall system architecture consists of vendor product interfaces, file-based and several flavors of message-based integrations. The system integration architecture based on a solid

Enterprise Service Bus framework provides the flexibility to manage all the integration points and also isolate some product customizations from the core vendor products. This reduces the risk and effort of incorporating known product upgrades into the release strategy.



About the authors

Sabrina Geary (ssgeary@cpsenergy.com) is the director of IT Technical Services for CPS Energy. She has more than 15 years of experience, including consulting and advisory services experience specializing in matters such as consolidating and streamlining business practices, improving processes, SOX compliance and ERP systems implementation rescue. Prior to joining CPS Energy, she served in a variety of executive-level roles including vice president of finance and administration for a Los Angeles, California, U.S.-based film and television company, with headquarters in Berlin, Germany.

Mark Hatfield (mhatfield@enspiria.com) is a principal consultant at Enspira Solutions (Denver, Colorado, U.S.). He has 22 years of professional experience, including 13 years of experience in the energy/utility arena. Hatfield specializes in smart metering/smart grid, meter data management, field automation, mobile workforce management and geospatial systems for gas and electric utility operation. He supports utilities in AMI and MDMS solution planning and systems integration. Hatfield is a member of the AMI MDM Working Group, Utilimetrics, Geospatial Information and Technology Association (GITA) and the GITA Industry Trends Group Advisor (electric subgroup).