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Moving to a New Meter Data Management System

The Story

Introduction

The following is an overview of DTE Energy's migration from a traditional meter translation function to a Meter Data Management (MDM) system. Phase I of MDM has been in production since May 23, 2008 and is the culmination of a four year effort. Starting with a business case analysis and ending with the rollout, a large cast of personnel, and their skill sets, contributed to the successful installation. This story will also take a peek at the next phase of MDM and its eventual integration with an upcoming Advanced Meter Infrastructure (AMI) project.

History, Business Case & Project Management

In January, 2005, a timeline was set with a projected kickoff date in early February, 2005 and a scheduled completion date of December, 2005. However, the project proved to be more complex than anticipated, on every level.

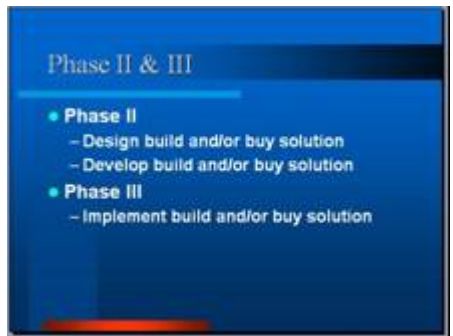
History

The old translation function had three different meter translation systems, one of which whose purpose was to handle large industrial commercial accounts for electric customers was 13 years old. This system had been customized to meet specific needs of various departments outside of its original billing function. The degree of customization increased the effort required to upgrade the application to the point of making the undertaking of such a project prohibitive. Upgrading had therefore been put off

until the application was no longer supported, nor compatible with current hardware and operating systems. Also, the number of meter reads had exceeded the capacity of the application, putting even more pressure on a failing infrastructure. The translation group compensated for the mounting shortcomings through manual interventions. Eventually, the system became less a system and more a collection of manual processes. Dependable data delivery and quality suffered. From the Load Research perspective, staying within acceptable precisions was an issue. Out of support hardware and software, operating at over capacity started to fail, causing data integrity to become a constant problem. Any gains or improvements were unsustainable - the unraveling just got worse.

Project at Inception vs. Actual Project Scope suffered from a degree of 'scope creep' for reasons external to the project itself. The original project scope started out with some simple goals; have a central repository for all meter data and have a calculation engine/tool to move the storing, calculation of the raw data and billing determinants to this repository. Since there had been a large number of customizations made to the previous application, it was necessary to ensure that the MDM system had the flexibility to accommodate those customizations and that functionality was therefore included in the project scope as a deliverable. All three phases of the migration project were scheduled to be completed in the year 2005 at an estimated cost of \$1.6 million.

However, the project took almost four years to complete at a total cost of \$8.2 million; (see Appendix A for how those dollars were spent) the original time and cost estimates were overly optimistic.



Original time and budget estimates were premature. The initial analysis of the needs – and complexities involved – of business users had not yet been completed to determine an accurate timeline and budget. This analysis, and resultant business case, took most of 2005 to produce, pushing back the original timeline significantly. Another factor, which blindsided the team and caused significant delay, was a corporate edict that the business requirements for an enterprise-wide AMI project would be added to the mounting complexities of the already complicated MDM teams’ task at hand.

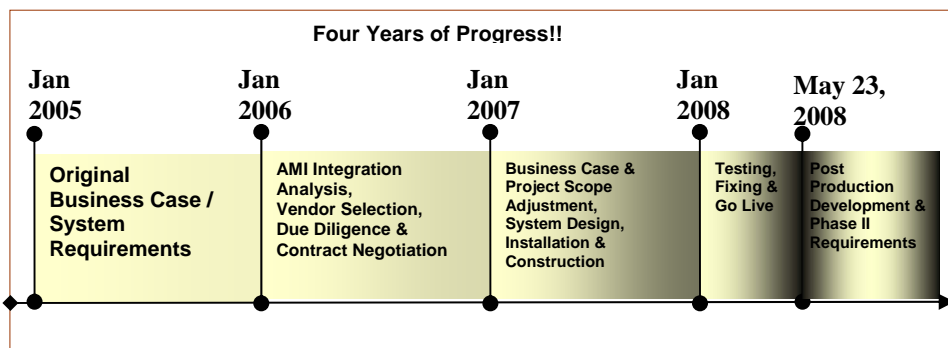
Load Research’s Changing Requirements became a factor during the AMI re-evaluation of the MDM business case/requirement analysis. Enter The Advanced Metering Project. In the fourth quarter of 2005, senior management announced a corporate-wide commitment to implement a service territory-wide electric and gas AMI initiative within five years. Because MDM is the very foundation for AMI, the project scope and business requirements had to be reexamined/expanded for the greater purpose it would serve; this second round took an additional year. During this time the project team made a decision to buy, rather than build, and selected an MDM

application. By the end of the third quarter of 2006 a development environment had been installed and the design and development phase had been setup to go. Load Research was hit by its own surprise; the wireless communication vendor announced an earlier than expected termination date of analog services. While there was already a project underway to replace some Load Research sample meters with smart meters, the timeline needed to be adjusted, due to the early termination of these services. Load Research was able to expedite the installation process and replaced two samples with smart meters in the fourth quarter of 2007. It was then possible to include these sample meters in the MDM development. This was the first taste of AMI for the new MDM system.

Business Case

The business case/requirement analysis is the process of assembling/articulating the projects’ scope and justification. The resulting documents are used to secure funding from upper management and become the foundation of the design-to-specification. In the case of this project, this was a two pass process, each taking about a year’s time. In the first pass all the business users met in one room during the first year. Each user mapped out their area’s interface with the existing system, defined the current shortcomings and created a wish list for the future. The second pass consisted of an analysis of the AMI business requirements of MDM and a buy versus build determination. Below are the key points that made the business case for MDM.

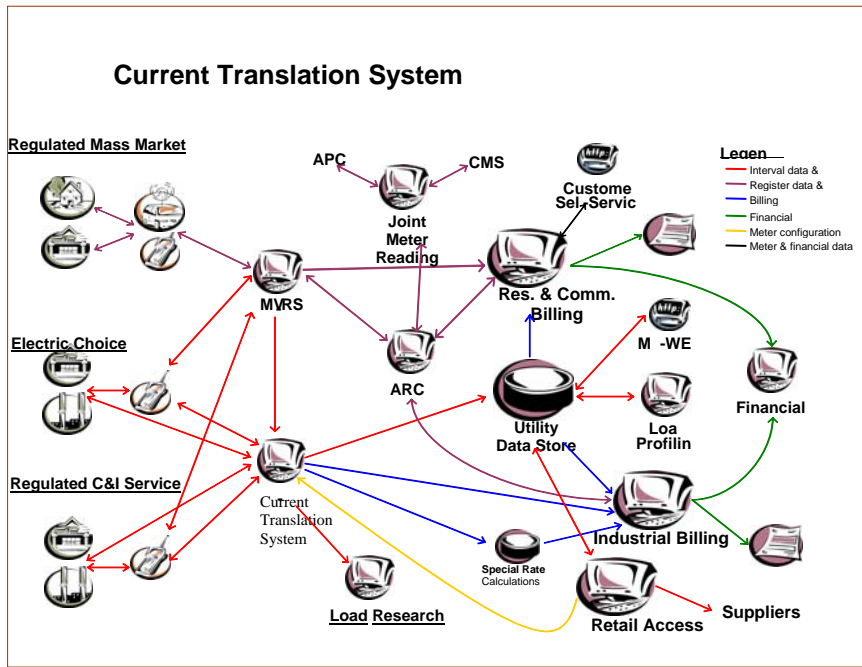
AMI and Demand Response initiative raised the importance of this project. MDM is the foundation



for future AMI initiatives. With the prospect of having to manage 4 million intelligent meters (2.8 million electric, 1.3 gas), a robust MDM is a key determinate for AMI feasibility. This critical piece of infrastructure provides the means for managing the complexities included with various meters and field/information gathering devices and the communication protocols they use.

cycle) energy usage across the hours in the month for customers that are served by AESs. Links between various corporate systems are essential to accumulate and validate the data required by the profiling process. The level of profile accuracy improves the supplier settlement process. The MPSC mandates a level of accuracy and precision to remain

Business users were not able to automate processes due to the fact that the translation group had become mired in their collection of manual interventions and resultant irregularities in quality of data. Resolving data quality issues and the undependable data flow became a full time job. Enforcement of Conventions for aggregated customer sites was a major business requirement. Over time the translation group had strayed from established conventions regarding aggregated customer sites that could not be addressed systematically. This meant our biggest customers could only be managed manually. Our major account system had been transformed to major account electronic recordkeeping chaos. Flexible Application Architecture was also an important requirement; after all, it was the lack of flexibility that caused the customization that discouraged the necessary upgrades that gave rise to this project in the first place. Flexibility also leaves open the possibility to use the application for other uses, like Load Research!



Changing Regulatory Environment exposed the shortcomings of the current system and the resulting liability to the corporation. There were many business drivers for both MDM and AMI initiatives, including the need to address aspects of the Energy Policy Act of 2005 (EPACT). This act seeks to promote energy efficiency and the more effective management of distribution systems. The Michigan Public Service Commission (MPSC) Mandated Collaborative requires DTE to provide daily profiles to Alternative Electric Suppliers (AES) so that suppliers can most accurately schedule supply to match demand. Profiles are based on statistically representative cross-sections of Detroit Edison customers, and are used to distribute monthly (billing

in full compliance. The use of profiles also eliminates the need for interval demand meters for AES customers, which reduces costs and complexity from Detroit Edison's Electric Choice program. Detroit Edison would be in noncompliance with the MPSC Collaborative order if profiles were not provided to the AESs. This was the most visible Load Research business driver in the MDM business case analysis.

Being Able to Achieve More With Less was the least talked about determining factor but internally probably the most important. Automation of processes provides the means for dependable, sustainable delivery of data.

Business user accessibility was not a possibility with the current translation application. Any information regarding customer setup, meter setup or read logs (if there even were any), in short, any information that was not in your interval data file, was not available. Any customer or meter setup information needed to fill interval data gaps (resulting from system or manual process failure) had to be specially requested, burdening the translation group with yet another manual process. Thus the business user's ability to access and retrieve their customer and meter setup information, and interval gaps was also a key business requirement for the new MDM.

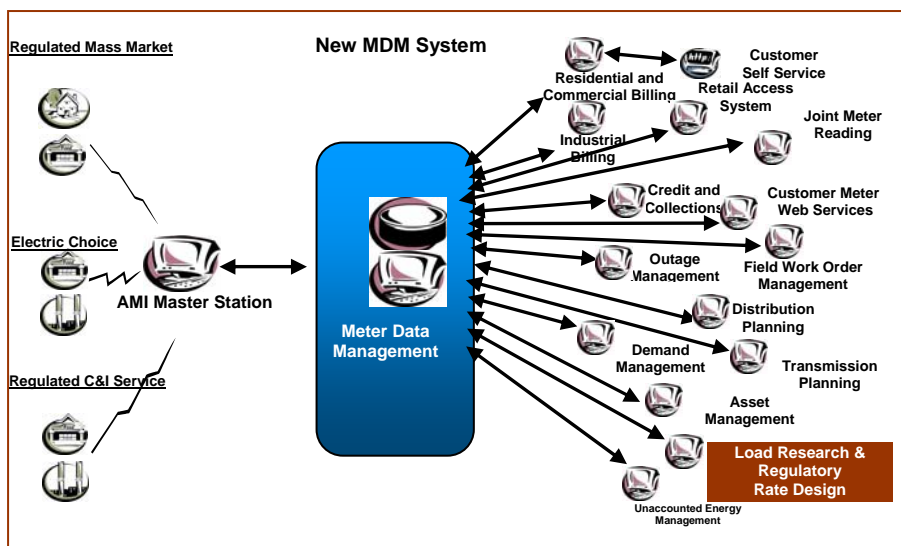
Project Management – Keys to Success

Good project management must exist for a project to be successful. This project had some good ‘bones’ such as assembling a good project team, having a good plan, having the right people driving the development objectives and an unbending dedication to testing.

Assembling The Project Team was the project’s defining step. All Business Users, referred to a stakeholders,

and coordinated project development with the vendor. ITS had a dual role as a stakeholder even though they were not an actual business user—they provided the project manager. The project manager functioned as an ITS producer who provided the ITS resources for the project and answered to the steering committee. The steering committee directed the project and reported project progress and funding requirements to top management.

lists was a somewhat rigorous process. From the perspective of a stakeholder business unit, if the value added significance of a ‘wish’ was not obvious, verbose justification was necessary to keep it on the design-to-specification. In some cases, this defense had to be made multiple times. No superfluous wishes survived this process. Documentation of the above into a design-to specification produce from the business case analysis proved to be more valuable than envisioned in the beginning. It is just human nature for memories to get short during the heat of the design and development phase, even under the best of circumstances. In our case, the ITS members of the project team had changed during the 2006 reevaluation. This meant that the team doing the design and development was not intimately familiar with the design specification. Key points were often missed and ITS team members requested information that had been clearly stated on the document. This later caused problems well into the testing process. The Business Case/ Business Requirement document was the project contract and was the one constant; without it, the project would have lost itself in the heat of battle.



were represented; Load Research was one of six. During the first business case/business user requirement analysis, representatives from each business user area attended weekly meeting[s]. It was the first time that all of the users had gathered in the same room at the same time. The exchange of information, shared challenges and shared expectations that had not happened for a long time (if ever), set the stage for the project’s eventual success. After the second business case, only the Manager (or Manager’s representative) of the stakeholder business unit attended a meeting at least once a week. Our Information Technology Department’s role (ITS) as Transition Agent provided the design and development personnel

Defining and Communicating Project Requirements provided the points of navigation that kept the project on course.

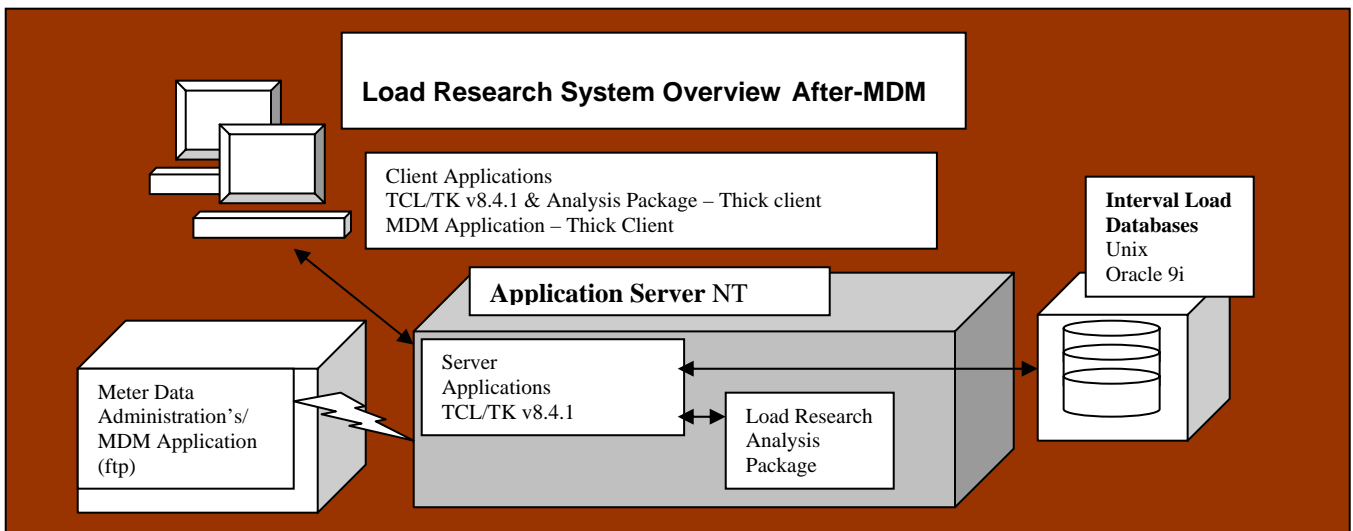
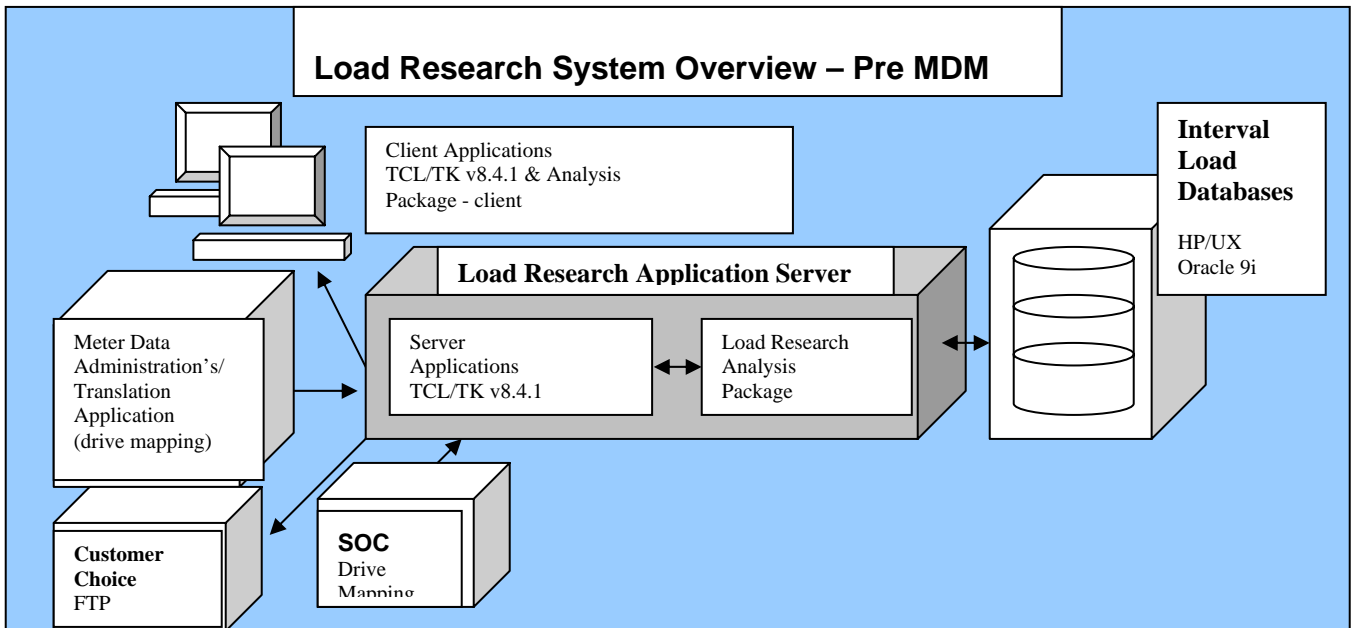
Articulation of current system shortfalls and new system wish list was the primary activity of the first business requirement analysis. To the credit of the project team, they did not rush this process. This project would not have been as successful had they let the time line drive this analysis. The extra time spent analyzing the common, multi-user functions, versus the special, customized needs of individual users, more than paid for itself. Quantified evaluation of the resolution of problems and the fulfillment of wish

Process Owners Driving Development Objectives kept the focus on the business requirements. Business users owned the project, which was a key to success. It is not unusual for either the ITS area or some other sponsor to own a major project. This is a flawed approach, as many of the objectives of the business eventually are trumped by other factors. Adjusting the project deliverables to meet the deadline will be the case most of the time. Business user ownership kept the

project on course. With Load Research as a process owner the project had the value of our perspective and expertise while at the same time insuring the fulfillment of our business requirements. The steering committee was comprised of the business users and it drove the project. That, combined with the extensive analysis performed during the business case/requirement phase that charted the course, kept the project on track. In response to barriers encountered, the ITS and vendor/technical teams attempted to shift the project direction. The steering committee's commitment to adhere to the project's design specifications

allowed the project to stay on course and hit its mark. Business and technical groups worked together to resolve issues as they came up. Each stakeholder business unit had their own data interface, each needed to be adapted to or developed from scratch, in order to receive the push from the new MDM. Each stakeholder business unit therefore has its own project in-and-of itself. Load Research's data interface involved the oversight of the vendor produced export utility while designing and developing what amounted to a complete overhaul of the data receive and loading utilities.

This proved to be more than a full time job during project development and testing. Business owners authorized each step as a landmark was reached. Before moving on to the next step, the ITS project team was required to verify the fulfillment of the objectives laid out in the project plan. Upon satisfaction of this objective, the business owners would sign-off approving the advancement of the next step. Due to this oversight, nothing specified in this project fell through the cracks.



Testing, Testing and More Testing was the key reason that a system of this complexity functioned extremely well from the point of go-live. All business owners participated in the various stages of testing. The testing methodology, progress and results were reported during the weekly stakeholders meeting. Initially, interface testing started during the development phase in late 2006 and continued through all stages up until a few days before the go-live date. Every opportunity to test on every point we could imagine was conducted and we still wish we could have done more. Parallel testing is a method of verifying a new system by running the old system and the new system in parallel, then comparing their results. This is the ultimate way of validating a new system. A challenge for the translation group was having the meters in the field being read by two systems given the limited line capacity. The other difficulty is accounting for discrepancies between the two systems ('a man with one watch knows what time it is, a man with two watches does not'). Interestingly enough, the first attempt to enter parallel testing was stopped because, more often than not, the MDM was correct. So a major effort to clean up the data and setups on the current application had to be completed in order to continue testing. Validation methodology deserves special attention in that simply looking at results is not good enough. The percentage that your eyes will miss will be enough to allow data corruption. Validation scripts need to be written to evaluate testing results to produce exception reports. These scripts categorized the exceptions to facilitate resolution of the issues that triggered the incident. Full Billing Cycles, all 20 of them, were tested twice before our go-live date. Toward the end, a tough decision needed to be made on whether to test the last cycle for the second time or move the go-live date back. Moving

the date back, because of the billing system implications, meant moving it back a month along with all the additional expense the would come with it. When push-came-to-shove, project management elected not to cut the last billing cycle out. This was good because our largest industrial customers are in the last cycle however, as it turned out, the cycle was completed on time and there was no need to push the go-live date back. The point here was to illustrate the level of commitment to testing exhibited by the entire project team.

Load Research Impacts & Concerns

Load Research needs unique, and sometimes exclusive, access to the system because of how we use and report on the data. Our main concern was that our unique needs, regarding data access, would not be met. These needs include access to the MDM application and system functions; processing and reporting of data; sample point confidentiality, and data editing.

Having necessary access to application & system functionality was our first concern. Training requirements needed to be established in the business requirements otherwise they would have been forgotten. The tendency is for the training needs of Load Research to be over looked, if not denied; our presence as a business stakeholder insured that our needs were met. Because the training emphasis was on the billing and major account users, the training we received amounted to the tips and tricks portion. This wasn't because we were being cut out, it was because we had hands-on access to the application and copies of the application manual for almost a year

prior to the training, and the tips and tricks were exactly what we needed. Application and system documentation is more important than training, as it provides a conceptual view of the application itself. Because the MDM application and documentation was well put together, an understanding of its concept and function was intuitively obvious. Application and system access, like training, was an area where Load Research would have been cut out were it not for our business stakeholder role. Full read only access is necessary for Load Research, with full access to both sample and export utility setup information. Like the other points above, access and the level of access has to be explicitly stated in the business requirements/ business case document as if it were a contract, it is a contract!

Process flexibility and reporting capability unique to Load Research needs had to be defined; access to necessary functionality begins with thorough requirement identification. This, of course, had already taken place during the business case/ requirement analysis. That established, how each identified requirement would be fulfilled using the application would determine the necessary level of access and functionality. As for the application functionality itself, when the entire application setup can be managed through the Graphic User Interface (GUI) to the point where the relational database is transparent to the user, it's a good sign that the application is of quality design. On the other hand, if the table structures and limitations of the database engine drive the functionality of the GUI, not the business function, then keep looking for another product. Transaction & Batch Capability is

another requirement in order to achieve any degree of automation. MDM applications evaluated by our project team tended to be oriented to transaction, one at a time processing through the GUI. Non-GUI processing is either non-existent or achieved through yet unrefined web services. Even this method lacks the list processing or SQL Query capability required automate data retrieval. Query capability using SQL was also lacking in the products evaluated by our project team. MDM application vendors often lower the enterprise value and capability of their product by completely hiding their database table structures. This results in the removal of direct SQL query capability, making their product a stand alone application. This is a concern as the application then has a built-in limitation preventing automation when processing high volumes of transactions, setups and exceptions. Customization of Reporting is important as it provides the capability to assemble information in flexible formats for a variety of uses. In the absence of direct SQL capability, a tool allowing you to assemble reports containing both interval and meter metadata, is the next best thing.

Maintaining security for sample point confidentiality required specification to prevent any misunderstanding regarding access to Load Research samples within a common meter repository. Code of Conduct needs to be enforced through the MDM application security policy. This application security policy needs to be nimble enough to accommodate Load Research's need for access to sample point data, but keep the data inaccessible to others to ensure compliance with Code of Conduct and confidentiality agreements.

Data Issues comprised 90% of the effort during the Load Research interface and parallel testing. Data content, format

and time span made up the bulk of our effort. Hour beginning vs. hour ending issue can cause problems as some Load Research analysis tools store and report in hour ending when most relational databases see time as hours beginning. This can result in data gaps or overlaps and a massive data clean up effort. Daylight savings time adjustment when and where it occurs needs to be established, both currently and going forward. Be sure that this policy is stated in the business case/requirement document. In our case, a misunderstanding had existed for years and it almost got us. New cuts picking up where the previous ones left off is a go-live issue in the case where Load Research is maintaining their own database for their analysis tool which is fed by MDM. The MDM application needs to be able to take the last export, on a sample by sample basis, from the current system and pickup from that point. In fact, if your analysis tools requirement has a requirement for end-to-end intervals, keep in mind that this requirement is not widely known and should be stated in the business requirement document and verified at every stage of testing.

Post Production

The Process of Going Live

When the time comes to actually throw the switch cutting over to the new system it is always a nervous time regardless of the preparation. Having experienced this many times over many years, the 'boiler plate' practices below have served previous efforts well and proved to be valuable once again.

Going live preparations began the first day of the interface development

on the Load Research end. Creating a Go-Live Script/Procedure is critical in that it can be put together ahead of time in a state of calm, allowing for a thorough analysis. This involves identifying every task that needs to be completed before cutting over to MDM. Next, determine the sequence in which each task is to be completed -a lot like establishing a critical path. It helped a lot to look over the tasks and task sequence seeking opportunities to combine and/or automate. Create a check list. Doing the above seems like the obvious but I've used this for many rollouts, both big and small and find it to be an invaluable practice during the heat-of-battle. Establish a cut-off date and enforce it, if you're receiving a data stream. In our case, this provided the opportunity to supply the translation group with the start date and times, by customer id, expected in the first MDM export. Receiving data after the cut-off date would be a set up for a major data clean up effort. The data received after the cut-off date was saved off just in case. Have a rollback plan/procedure like the drill to create the go-live script. It's the same thing only going backwards.

Benefits Realized

Having Meter & Aggregation Data Available allows the filling in of gaps in interval data. This may seem like a small benefit but for us it is huge. Historically, one Full Time Equivalent (FTE) is used putting together data requests for the translation group to fill. This new capability allows us to retrieve data ourselves, saving time for all. In short, direct access to interval data taps us directly into the life blood of Load Research.

Sample Recovery is no longer guess work; MDA application logging functions allows us to track down what sample points are failing, where they are failing and why they are failing. Two weeks after going live the Detroit Edison service territory was hit with the sixth worst storm in history resulting in significant sample loss. Using our new tools, we were able to troubleshoot and recover our samples as never before. With the smart meters installed, we saw how our new capabilities could be used for outage analysis. Just think, by using radar to predict where a storm will be most severe –smart meters within the affected zip codes could be ‘pinged’ and the picture painted by the non-respondent meters, when combined with distribution circuit information might instantly locate and diagnose problems before customers could even get to the phone to call, hmmm.

Dependable Data Delivery is now a reality. Data quality looks great. Some small problems with multiple site (very large) customers showed up but the overall impact has been reduced because of the tools the MDM system provides.

Lessons Learned

Looking back and reflecting on what worked along with that which did not, these points stuck out the most.

Review Documents Early & Often, as this is the system’s blueprint/design specification. This also serves as a reminder as to what is being requested. Human nature tends to either embellish or forget key points over time. Also, look for requirements that may have been left out. Remember everything needs to be stated.

Assume nothing, as even the smallest most obvious requirement not stated, can become a catastrophic

misunderstanding if left out or left unsaid. It also provides for multiple opportunities to identify requirements that may have been missed.

Stick to Your Guns when difficulty fulfilling one or many of your requirements starts causing problems with overall system objectives. Expect that pressure will be applied to either drop or change the requirement[s] involved, which is a good time to remember why the requirement was included into the design to specification in the first place. The business requirements of Load Research more often than not also benefit other areas of the enterprise, so allowing the design-to specification to be compromised without revisiting the business case may likely have a cascading negative impact throughout the corporation.

Correctly Identify the Critical Path and stick to it. In the heat of battle during development and testing, it is easy to get side tracked. Mapping out using Critical Path Method (CPM) in advance is a proven method of planning your work and working your plan during a relative state of calm. This is important to insure that the process has been ‘thought through’ and that all issues, along with their relationship to one another, have been taken into consideration. Applying such planning to each phase (business case analysis, system development, system testing, parallel testing, etc.) served us well during this project. Abandoning this process was where we ran into trouble in cases where progress was moving too fast or when an obstacle ceased all progress.

Going Forward

With the passage of a few months the smoke has cleared and the vision of our next steps is coming into view.

Cooking More Load Research into MDM is where you use the application to perform Load Research functions such as class aggregation and analysis. The far reaching application privileges and the disparity in function from production MDM tasks would require the Load Research-within-MDM application to have its own area. At DTE we are currently evaluating this option, as we are still learning the MDM application’s capabilities. We are in the process of compiling a business case/requirement list (Phase II) and preparing to meet with ITS project members. Roughly, from the view of the author, the possibility of using the MDM application as a Load Research analysis engine in the near future looks good, given some changes are made.

Integration of Strategic Load Research into MDM was touched upon above regarding the possible application use for outage analysis. By utilizing the application to access interval, meter and setup data, our ability to do more with the data in specialized instances will permit us to serve a broader client base. Providing the Load Research-within-MDM application is implanted and AMI comes into fruition, real time Load Research core products will become a reality before too long.

More Automation & Applications will only be possible through the development of a legitimate application interface. As it stands now, the MDM application’s architecture is setup as a stand alone application whose GUI interface is

the only means available to access all interval, meter and setup data information. A prototype web service has been developed for specific queries that can be developed on request, on a transaction basis with no real direct query capability. Without a real application-to-application interface, the potential for a Load Research-within-MDM application or integration with other enterprise systems will be capped at the MDM basic function of being a central repository.

Summary

Nearly four years ago an ageing traditional meter translation application was failing enough to force DTE to start the process of replacing it with an MDM system. The expense of maintaining the existing infrastructure made for an easy business case for replacement, along with changing regulatory and enterprise requirements. Projected benefits reached a critical mass to overcome the costs and effort involved with installing MDM. During the business case/business requirement analysis, it was critical for Load Research to have the role as a stakeholder/process owner. Both the enterprise and project benefited from the expertise Load Research brought to the table, while insuring their unique business requirements were incorporated into the project. A corporate edict to initiate an AMI effort increased the scope and delayed the project for one year. The project went live this last May 23rd, costing more in both time and money than originally estimated. In the end, the resulting application satisfied the scope laid out in the business case/business requirement analysis and, despite the added time and expense, the project is regarded as a success as the benefits anticipated were realized almost immediately. Having the foundation of an MDM system in place laid the

foundation for the upcoming AMI initiative.

Upon reflection, the project's success started with how the project team was made up and steered by the stakeholders/process owners, and the Information Technology group's dual roles as transition agents and stakeholders. The project team was responsible for validating the project documents from the initial business case; design-to specification; and all the way through to the final sign off authorizing the system to go live. Most importantly, the process owners were responsible for driving the development objectives. The business owners also participated in every testing phase and were responsible for the design, development and testing of their system's interfaces. Dedication to testing turned out to be a major key to success.

For Load Research our concerns included having the necessary access to the new applications functionality including the training and reference documentation to insure that we would be able to gain expertise in how to work with the new system. Being able to extract the information we needed while fulfilling our sample sight confidentiality and code-of-conduct compliancy obligations was another issue. Working out data formatting, Daylight saving time and file over lapping proved to be another challenge.

After going live, Load Research almost immediately realized benefits from being able to view and access all interval, meter and setup data information. We were able to actively pursue recovery of data and sample points with new tools for the first time. Our new capability quickly passed a test when we were

able to recover a major sample loss caused by a severe storm. The experience gave light to how our new found tools could be applied in other areas, such as outage analysis.

Looking back on the project what sticks out the most is the necessity to 'plan your work and work your plan' and that where the highest risk is 'not a plan that fails but a failure to plan'.

From our standpoint, Load Research has the potential to further utilize the MDM application, providing the application's architecture evolves beyond its current proprietary GUI. If not, the role of MDM, in regards to Load Research, will not grow beyond that of a central repository for interval data and meter information. Given this outcome, new strategic load research applications will utilize existing in-house resources.

Comments Welcome

Conversion to an MDM system is most likely in your future, if you are not already engaged in the process. Should you want to share your experience or have questions about ours, we welcome your comments. Forward your comments or suggestions to the author at:

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Appendix A

MDM Project Team O&M and Capital Cost

