



Itron White Paper
Itron Enterprise Edition™
Meter Data Management

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Active Smart Grid Analytics™
***Maximizing Your Smart Grid
Investment***

Sharelynn Moore
Director, Product Marketing
Itron

Stephen Butler
Managing Partner – Industry Consulting
Teradata

Itron

TERADATA.



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Introduction

In the United States alone, it is estimated that over the next 20 years \$880 billion will be spent by utilities on metering, communications, and distribution and transmission improvements. Business cases abound, projecting savings from how personnel, energy, and infrastructure can all be used more efficiently. In addition to utility-side efficiency improvements, end consumers presented with more complete, timely and accurate information—along with price incentives—are projected to change how they use energy in ways that reduce their own costs, and in so doing create efficiency-related benefits for utility companies as well as our environment.

In this paper, we introduce the blueprint of Active Smart Grid Analytics™—a powerful platform where business value is derived from analytics driven by Smart Grid information. We further explain how, through an integrated business view, Active Smart Grid Analytics enables smarter, faster decisions while lower operating costs.

Typical Projected Benefits

Many Smart Grid initiatives include an advanced metering infrastructure (AMI) deployment as an early step. Itron understands that AMI is only a part of the larger Smart Grid landscape. Many benefits of a smarter grid are enabled by AMI, but others need a more comprehensive view of the grid.

Common benefits projected as a result of investments in advanced metering infrastructure (AMI) and Smart Grid, typically fall into several categories:

- Operational efficiency
- Customer service
- Energy efficiency
- Asset utilization

Basic operational efficiencies are the simplest and easiest benefits to capture. Manual meter reading is eliminated, crews can be deployed faster and more efficiently in response to an outage, faults can more readily be identified and service more quickly restored. Customer service is improved through more accurate billing, a more convenient move-in / move-out process, and proactive communications. Energy efficiency improves through more timely and effective demand response, through more targeted conservation and incentive programs, through reduction in energy theft, and through optimized engineering and operations. Generation, transmission and distribution assets are more fully utilized by deferral of capacity additions and the availability of more detailed load data for planning and operations.

Unanswered Questions

The benefits above comprise an impressive list, but what is missing? Consider the following examples of questions that must be answered:

- As a customer, I am considering purchase of a plug-in hybrid electric vehicle (PHEV). My utility will purchase the excess energy, but since the PHEV energy purchase price varies, how do I determine my energy credits and decide if purchasing a PHEV would be an economic choice?
- As a utility CFO, I am weighing recommendations from our engineering department on a number of capital improvements to our distribution system. I am unable to fund all of these improvements. How do I determine which of these projects will benefit the largest group of customers, by what amount, what the financial return to the company will be for each project under consideration, and, for the projects not funded, what the effect on service reliability will be for specific customers and groups of customers?
- As a utility operations manager, I must decide whether to take equipment out of service for needed maintenance. If I take the equipment out of service now, during our critical peak demand period, what will be the impact upon the cost of energy to our customers and to the company? If I defer the maintenance, the risk of equipment failure, unplanned outage and even higher costs is present. What information do I have to make the correct decision?

To answer questions such as these, ready access to integrated customer, financial and operational information—along with the application of advanced analytics—is necessary. Achieving maximum return on a Smart Grid investment depends on being able to provide timely and insightful answers to these and similar questions.

Current Limitations

AMI and meter data management (MDM) represent important first steps toward the realization of Smart Grid benefits. A robust AMI installation allows the distribution system to automatically communicate with the meter and also allows communication within the home. A robust MDM system provides a way to manage and maintain raw and validated usage information, and can serve as a necessary bridge with the billing system. However, before advanced distribution and transmissions operations and advanced asset management can occur, additional bridges must be built with other operations and financial data. Some utilities will try and merge these disparate sources of information through a mixture of SOA connected operational data stores and domain specific data marts. One such approach is shown in *Figure 1*.

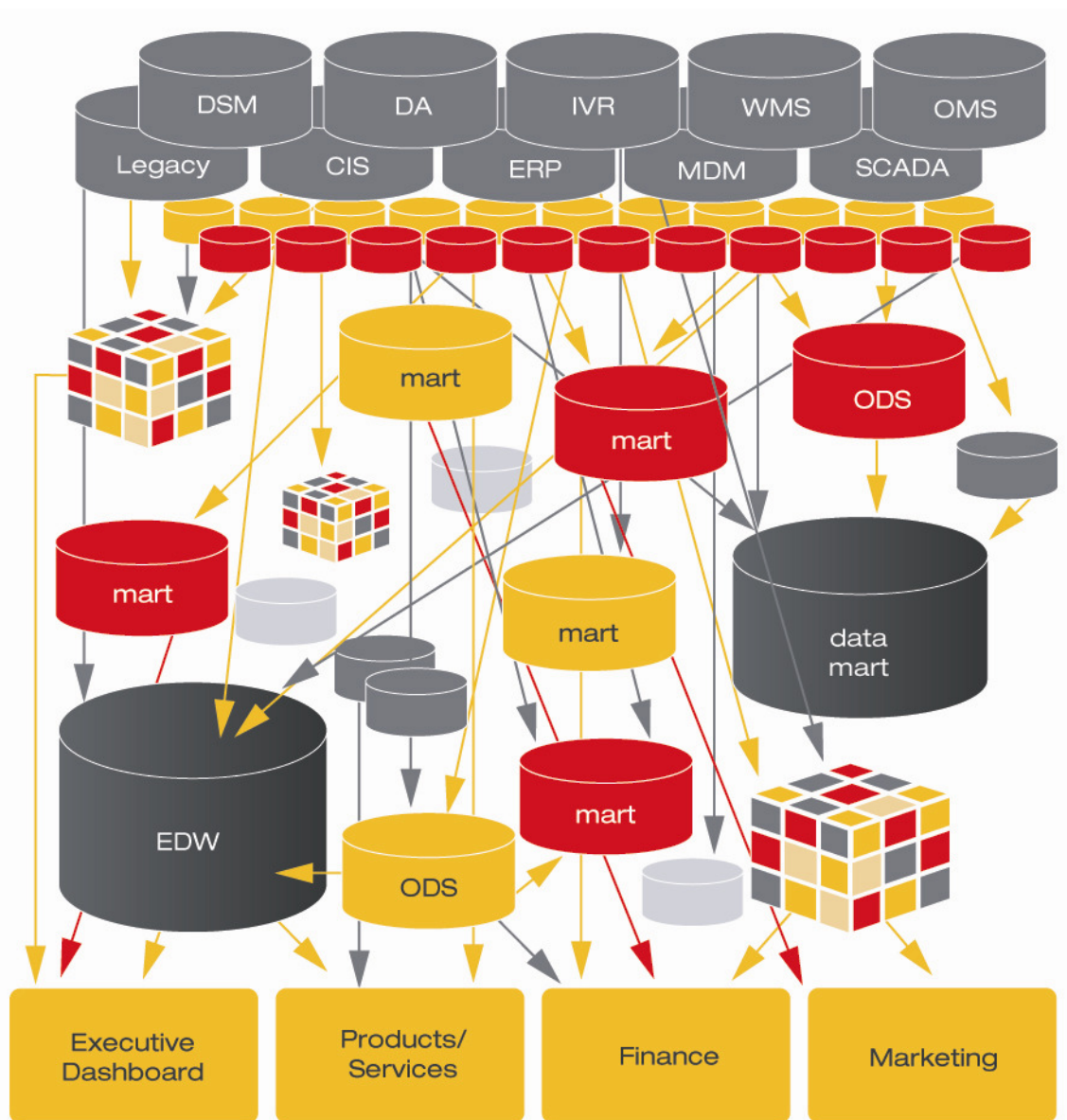


Figure 1: Typical Data Mart Approach

The data mart approach has, however, inherent drawbacks. Scalability is limited, the architectural approach is tactical rather than strategic, and there is a dependency on local data models and multiple database technologies, as opposed to a single database technology and comprehensive data model.

The proliferation of data mart infrastructure and redundant data creates serious issues in the long run. The cost to operate and maintain this fragile network containing distributed islands of information is significantly higher than with a simpler, strategic architecture. These costs will delay benefit realization of your smart grid initiative.

The Active Smart Grid Analytics blueprint represents an opportunity to more efficiently leverage the biggest asset created by the smart grid – information.

A Better Approach

Active Smart Grid Analytics (ASA) and the Active Smart Grid Data Warehouse (Figure 2), jointly developed by Itron and Teradata, provide a more extensible architectural approach that is not only easier to operate and maintain, but will also facilitate the application of near real-time analytics and enable smarter, faster decisions.

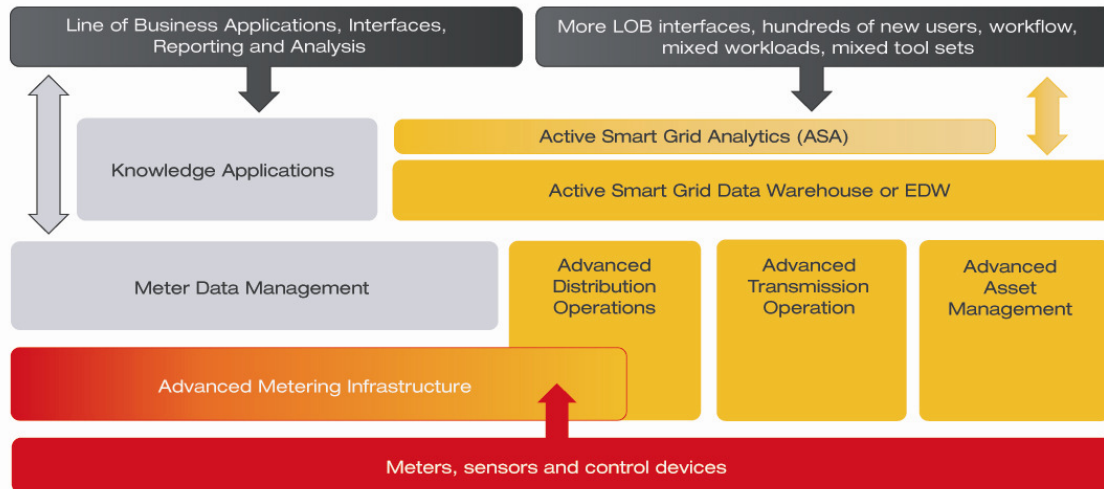


Figure 2: Active Smart Grid Analytics / Active Smart Grid Data Warehouse

The Active Smart Grid Data Warehouse must accommodate simultaneous loading of large data volumes from multiple sources and at the same time perform complex queries and sophisticated analytics. Warehousing the grid data on a linear scalable platform changes the game. With ASA, comprehensive grid data can be leveraged across the Enterprise. One such deployment approach to deliver Active Smart Grid Analytics is the use of Itron Enterprise Edition™ Meter Data Management (IEE MDM) system and Teradata's Enterprise Data Warehouse based on a Utility Logical Data Model (Figure 3).

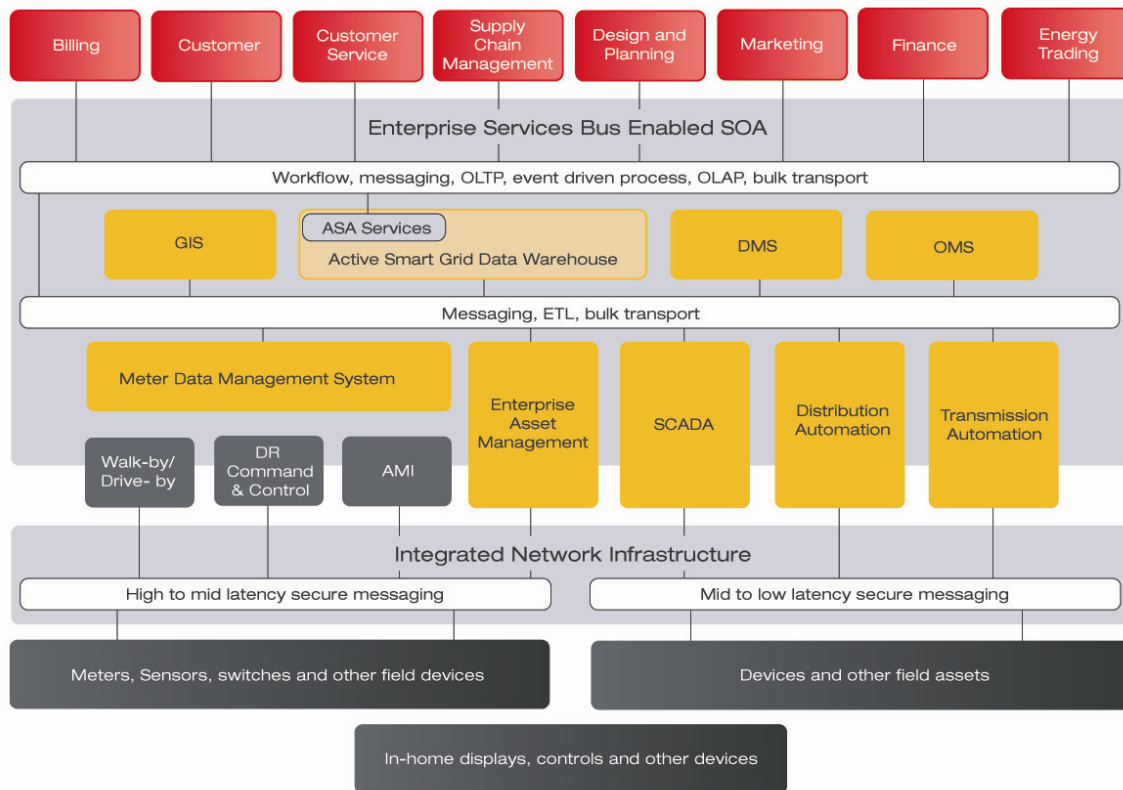


Figure 3: Technical Blueprint – Active Smart Grid Analytics

This blueprint acknowledges the fact that multiple Smart Grid operational systems must be deployed, and that the full value of the smart grid lies in integrated *active* analytics. These analytics are active because they are plugged into your SOA, analyzing and correlating data as it arrives, triggering actions, and participating in workflows. The power that ASA provides is when this capability is applied across multiple data sources. This shortens the decision cycle and also enables many interesting and valuable proactive scenarios.

A key component of ASA, as with any warehouse, is the data model. Itron and Teradata have partnered to ensure the Utility Logical Data Model (uLDM) is a comprehensive model for analyzing smart grid information. The uLDM provides a starting point, a huge head-start for utilities who expect to exploit the possibilities of an integrated smart grid.

Active, Smart Grid and Analytics are each key components of the ASA solution:

- *Active* – the near-real time loading, analysis and action of data from all related systems involved in the Smart Grid.
- *Smart Grid* – the inclusion of data from all functions and aspects of the utilities connected infrastructure, generation through customer.
- *Analytics* – the reporting, analysis and application of results to manage or effect change.

The Whole is Greater than the Sum of the Parts

ASA's benefits come from the fact that correlation and analysis of adjacent data domains create more value than analyzing them independently. Combining AMI data and asset information with billing information assures that energy used and metered is billed. However, ASA extends the value of that same information. Further combining that information with financials, customer calls and historical data

Here are some examples of the potential value of analytics that could be applied:

- The cost of service and profit associated with a specific demand response program can be easily calculated for an individual customer, segmented group or program basis. Program participation can be better predicted through analysis of historical behavior and current trends.
- Through real-time analysis of detailed data, service interruptions are anticipated or detected, located and diagnosed quickly, allowing system dispatchers to immediately focus on getting needed resources to the field to correct the problems.
- More detailed and accurate load forecasts are possible, enabling system planners to better predict asset loading and more accurately determine the nature and timing of capacity additions. Complete, historical, time-stamped information provides the basis for a more accurate projection of future peak loads. Future overloads and voltage constraints are more accurately identified, reducing unnecessary conservatism in current planning decisions.
- Transmission and distribution operators are able to adjust system flows to increase the loading of underutilized assets. Loading of assets under stress is reduced to lower probability of failure and extend service life. Improved load management allows more energy to be delivered per KVA of installed capacity.
- Each customer is notified by preferred channel, e.g. cell phone, text message, Email, alternate phone, etc. of a service interruption and kept informed of the projected time of service restoration.

The Time for ASA is Now

Many utilities are in the early stages of an AMI implementation on their way to a smarter grid. Advanced asset, distribution and transmission operations are coming quickly, but not yet completely here. There may be a temptation to defer a blueprint like ASA until more control devices, greater numbers of advanced meters and communications are in place and the data being collected at scale. Such an approach puts your back-office infrastructure strategy at risk of the data mart proliferation scenario.

A tactical approach also ignores immediate benefits that can be realized through implementation in a phased manner, one in which capital expenditures and benefits are

synchronized. The wait-and-see approach also does not allow consideration of behavioral changes in your planning and implementation of Smart Grid initiatives. The ability to analyze and segment customers, communicate interactively with them, and accurately measure the impact of behavior modification will be forfeited during the critical transition period.

Large Southeast Investor-Owned Utility Case Study

Utility Uses Enterprise Data Warehouse to Improve Corporate Collections

By applying sophisticated analysis of payment history, propensity to pay and economic data, a major U.S. utility was able to significantly reduce risk and improve collections from its commercial and industrial customers.

- **40% - 50% improvement in corporate collections**
- **\$8 million improvement in first year**
- **\$45 million improvement over five years**
- **Manual collections effort reduce by 2800 hours/year**

Learning from the Experience of Others

Telecommunications companies, retail, banking, travel and hospitality companies have been using identical technology for years to influence customer behavior, to more effectively communicate with their customers, to drive demand and to measure, analyze and optimize asset utilization.

For example, it is common for a wireless company to capture millions of detailed call records each hour, including location and termination information. The detailed call records are automatically integrated with customer purchase, billing information and call center activity as part of the load process. All data is available on the customer service desktop within 10 minutes, allowing the call center representative access to all relevant current and historical information for use in identifying and resolving the customer's issues. Additionally, network operators and engineers have the same detailed call records available to optimize network operations, reduce the frequency and duration of outages, maximize utilization and efficiently plan future capacity additions.

World Class Solution

Itron and Teradata, world class companies, have pooled their expertise to create the blueprint for Active Smart Grid Analytics, an integrated world class platform for the Smart Grid. Active Smart Grid Analytics is needed now to achieve maximum benefits from investments in Smart Grid technology for these reasons:

- Operational data systems such as meter data management, SCADA and others alone cannot provide the extensive cross domain analytics and warehousing that Smart Grid business intelligence requires.
- Utilities need a blueprint for a best-in-breed Smart Grid enterprise software architecture that will plug into their SOA, and also enable active analytics derived from multiple domains.
- Teradata, the world's leading company in data warehousing, and Itron, the world's leading company in metering and meter data management for utilities, are complementary and proven technology providers. ASA represents a vision and commitment to apply our core-competencies to smart grid, now.

To Know More

For questions or more information on Active Smart Grid Analytics and how Teradata and Itron can help you maximize the benefits of your Smart Grid investment, please contact:

Sharelynn Moore
Director, Product Marketing
Itron, Inc.
sharelynn.moore@itron.com
509-891-3524

Stephen Butler
Managing Partner – Industry Consulting
Teradata Corporation
stephen.butler@teradata.com
615-279-8286

About Itron

Itron Inc. is a leading technology provider to the global energy and water industries. Our company is the world's leading provider of metering, data collection and utility software solutions, with nearly 8,000 utilities worldwide relying on our technology to optimize the delivery and use of energy and water. Our products include electricity, gas and water meters, data collection and communication systems, including automated meter reading (AMR) and advanced metering infrastructure (AMI); meter data management and related software applications; as well as project management, installation, and consulting services.

To know more, start here: <http://www.itron.com>

Itron Inc.
Corporate Headquarters
2111 North Molter Road
Liberty Lake, Washington 99019
U.S.A.
Tel.: 1.800.635.5461
Fax: 1.509.891.3355
www.itron.com

About Teradata

Teradata Corporation (NYSE: [TDC](#)) is the world's largest company solely focused on raising intelligence through [data warehousing](#), [data warehouse appliances](#), consulting services and [enterprise analytics](#).

Teradata is in more than 60 countries and on the Web at www.teradata.com.