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CMS Deploys Energy Smart Grid Project

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CMS Enterprises operates the non-utility businesses of CMS Energy, and is recognized as a world-class operator of independent power generating plants. The company is refocusing its business strategy to concentrate on its independent power business in the US.

Currently the company has an ownership interest in seven generating plants in Michigan and North Carolina. Three of these generating plants are part of CMS' smart grid project, which is intended to improve the responsiveness and resilience of plant production under changeable market and physical conditions.

The Dearborn Industrial Generation (DIG) facility is located in Dearborn, Mich. The facility produces up to 710 megawatts of electricity and over 1 million pounds per hour of steam. DIG sells a portion of its electricity to third-party customers, and the remainder to the mid-west energy markets. DIG sells its steam to nearby industrial customers for their heating and processing needs. The facility consists of a 160 MW natural gas fired combustion turbine that entered service in 1999 and another 550 MW from two more natural gas fired combustion turbines (operating in combined cycle with three boilers) that entered service in 2001. DIG is fueled by a combination of natural gas and blast furnace gas, a byproduct of a nearby steel-making process.

The Kalamazoo River Generating Station facility, located in Comstock, Mich., is a single 68 MW simple-cycle combustion turbine fired with natural gas.

The Livingston Generating Station facility located in Gaylord, Michigan consists of four simple-cycle combustion turbines totaling 156 MW, able to reach full load in about 10 minutes. CMS Enterprises operates these plants and is sole owner.

The Project

CMS had its own ideas about the smart grid, and how to manage it. As a starting point, whatever they did they needed to ensure that senior managers had access to real-time data from its plants through the CMS web portal, while extending 'this view to plant control room personnel without adding more fixed SCADA displays.

The company's vision was to provide power tools for plant operators, so that decision making that requires "human in the loop" is streamlined and empowered by automated displays. The goal was to give operators and managers real-time access to unit net MW and AGC control on individual units, views for combined output, display start/stop instructions, LMP and pricing, real-time market results, penalty calculations and conditions, emergency messages through MISO market interface and alarms with an audible tone to draw operator attention.

The company also required easy access to 24-hour schedules, load trends, current plant output and ability to store data for one month all in one system. The system needed to support viewing previous-hour activity on a trend display and send data to a corporate SQL database. The system also had to generate reports.

The Solution

One important tool that CMS chose to support this initiative is LiveData SmartGrid Manager (dubbed a dashboard by CMS), a data integration and visualization platform. LiveData SmartGrid Manager provides real-time views into plant status through standard web browsers, reducing the need for SCADA workstations, while providing management with business insight into current operations.

SmartGrid Manager interfaces with critical components of the distribution smart grid, including AMI (automated meter infrastructure) and DRR (demand response reserve). This is especially important because, while both provide the means to manage power flow and energy on the demand side, neither provides a way to geographically report power or telemetry loss or help on the supply side.

CMS already used LiveData RTI, a real-time integration platform, to fulfill regulatory and communication requirements in the MISO market. Through the selection process and LiveData's history with the company, CMS anticipated being able to fulfill its vision of streamlined decision making with SmartGrid Manager, which incorporates a dashboard with RTI.

CMS initially added the LiveData dashboard at its Dearborn Industrial Generation plant to exchange, display, and report MISO ASM participation data and plant operation data. Importantly, the system leverages Microsoft Silverlight to provide richly interactive displays using web browsers already deployed on CMS desktops. The dashboard is accessed only through HTTPS and Active Directory authentication using CMS' corporate network.

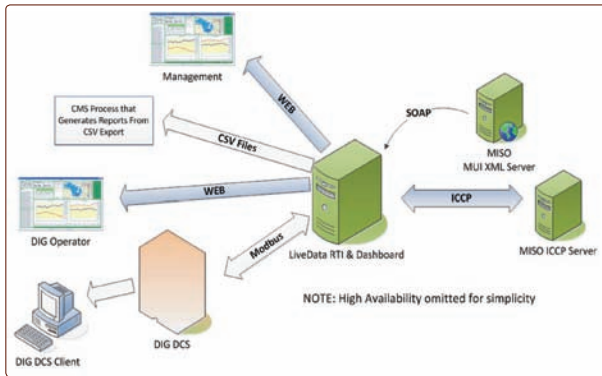
The LiveData dashboard gives the plant operators a market snapshot consolidated with a view of overall plant operations. This has led to greater operator awareness of the plant's role in the market place, resulting in a dramatically improved ability to generate profitable revenue based on changing market opportunities.

CMS has since extended this functionality to its Kalamazoo and Livingston plants, generating reports for these two plants. The company is forwarding telemetry from the Kalamazoo and Livingston plants to MISO through its existing MISO ICCP connection.

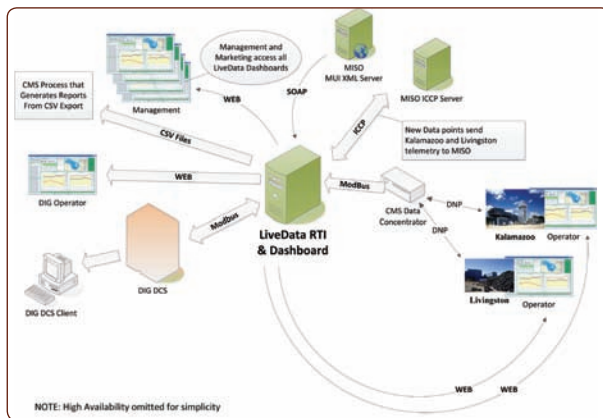
The new dashboard views and data flows are hosted on the company's existing LiveData RTI Servers installed at the DIG plant.

Before-and-After

The initial system context was as follows:



New System Context:



The data from Kalamazoo and Livingston is delivered to LiveData RTI server through a new Modbus/ TCP/IP connection via a Data Concentrator maintained by CMS. Plant output data from Kalamazoo and Livingston is added to data sent to MISO over the ICCP Connection. This allows for more reliable block loading. SOAP XML Dispatch, start/ stop, and LMP messages are received from MISO for the Kalamazoo and Livingston plants, similar to the messages initially received for DIG.

New Dashboards

As mentioned above, the new dashboard is hosted by the existing LiveData RTI servers. Each Plant has a separate URL and is independent from the others. Each has similar features and functions as the initial CMS Dashboard installed at the DIG plant. Site-specific modifications are supported enabling the removal of SetPoint MW, Econ Max, Econ Min, Mode In, and Mode Out fields from the Power Monitor for the Kalamazoo and Livingston plants, as these plants do not participate in the MISO ASM market and thus do not have these points.

What is ICCP and Why Use it?

Utilities throughout the world specify the Inter-Control Center Communications Protocol (ICCP) to provide data exchange between utility control centers, utilities, power pools, regional control centers, and non-utility generators. ICCP is also an international standard: International Electrotechnical Commission (IEC) Telecontrol Application Service Element 2 (TASE.2).

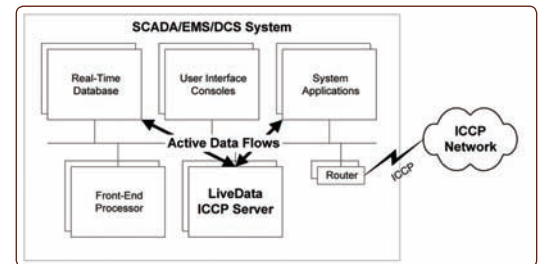
ICCP operates across LANs and WANs to enable the exchange of real-time and historical power system monitoring and control data,

including measured values, scheduling data, energy accounting data, and operator messages. Data exchange can occur between and among multiple control center EMS systems, EMS and power plant DCS systems, EMS and distribution SCADA systems, EMS and other utility systems, and EMS/SCADA and substations.

LiveData Implementation

The LiveData RTI (Real-Time Integration) software enables data to flow bi-directionally across diverse systems and protocols. The LiveData Protocol server provides a robust ICCP server solution, as well as support for both industry-standard protocols (OPC, IEC61850, DNP3 and MultiSpeak) and proprietary protocols (such as Modbus, ModbusPlus, PG&E and Allen-Bradley).

The LiveData Protocol Server runs in one or more stand-alone processors and provides a fully functional ICCP link with the ICCP network. It communicates with the SCADA/EMS/DCS real-time database and system applications via built-in server interfaces.



ICCP System Components and Data Flows

SmartGrid Manager uses on-line object configuration to minimize the cost and complexity of developing and maintaining ICCP, it also allows incremental, on-line configuration of ICCP links with other systems. This, coupled with LiveData's high level of integration with the Windows user interface, makes LiveData ICCP easy to manage and administer.

Benefits

Operators and managers now have real-time access to critical internal and market information that facilitates streamlined decision making. For example, LiveData SmartGrid Manager's integrated, automated displays provide pricing and other details and market data, as well as penalty calculations and conditions, all important in staying agile and responsive.

Fast reaction to fast-changing market conditions can optimize the sale (or purchase) of energy, contributing to CMS' bottom line.

Conclusion

New market opportunities reward companies that empower their people to move in real time with the market. For example, when a new market works in five minute intervals, they need to be prepared to act, now. Missing a dispatch costs money, missing three in a row costs even more, both from financial penalties and potentially in more subtle ways, such as public image and confidence. Operators and their managers need to stay out ahead and keep performance at peak. Leading companies know this, and employ state-of-the-art tools to empower their people to move quickly and reliably, capitalizing on market opportunities as they arise.

About the Authors:

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LiveData works with real-time data integration and display technology. The company's solutions gather data from any number of sources, coordinate it with team workflow, and present it as meaningful information on graphic displays. For more information visit www.livedata.com.