STATUS UPDATE: OPERATIONAL DATA MANAGEMENT SYSTEM

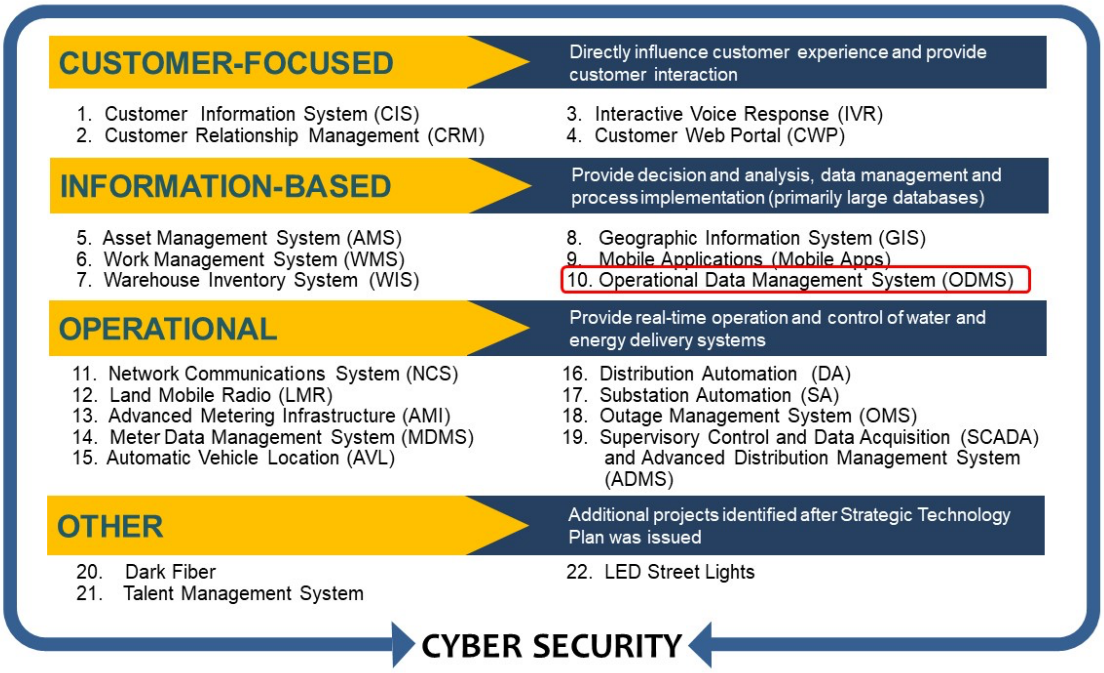
RPU Staff Report
Power Resources Division
Resource Planning & Technology Integration Unit
June 1, 2021

Staff Summary Report

In early 2015, Riverside Public Utilities (RPU) issued a Strategic Technology Plan (Plan) that outlined strategic investments in new operational technologies (OT) as shown in Figure 1 below. Twenty-two OT projects were identified, with the intent of implementing the projects over the next 10 years.

One of the most critical and foundational projects outlined in the Plan is the Operational Data Management System (ODMS). The ODMS is foundational for advancing the Utility 2.0 Strategic Plan, as it serves as a "data hub" or central repository for collecting, analyzing and visualizing operational data. An effective ODMS manages large amounts of data across multiple systems and workgroups and helps staff turn the data into actionable information to drive critical business decisions.

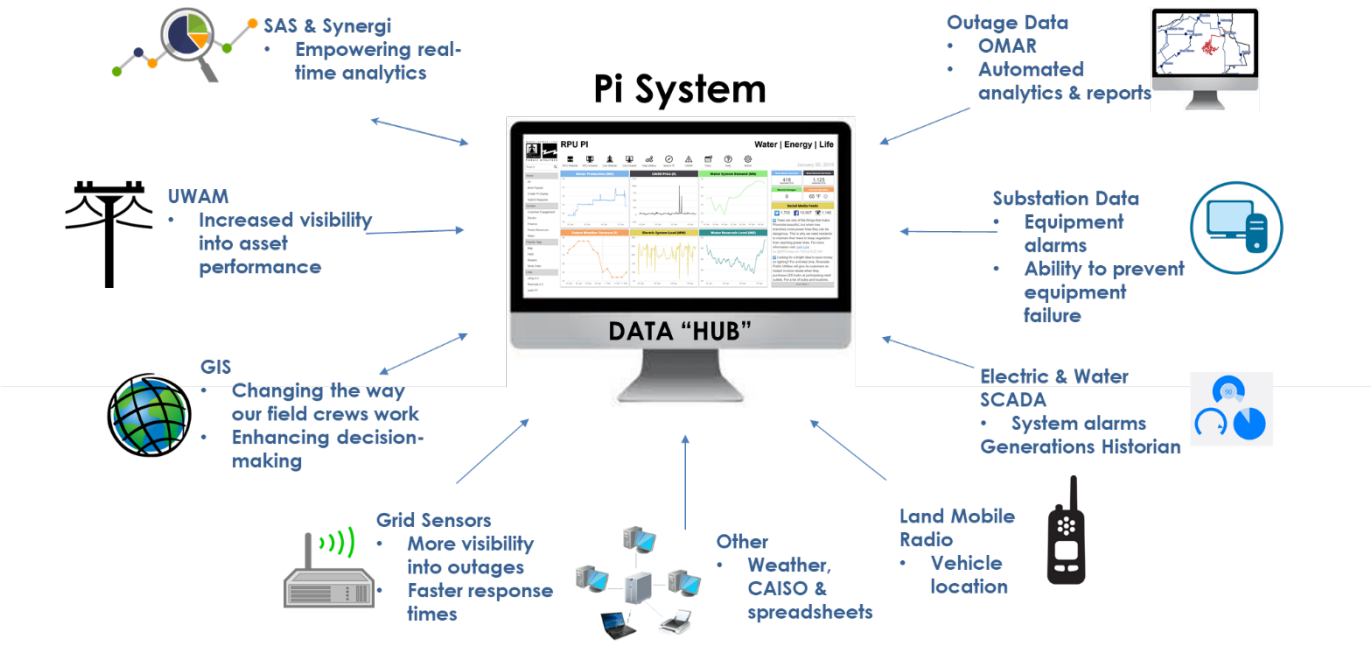
FIGURE 1 – Strategic Technology Plan.



All RPU divisions rely on data to make operational and fiscal decisions. Thousands of data points are collected daily from field equipment and monitoring devices, electric and water meters, customer interactions and financial transactions. As staff continues to implement the OT systems outlined in the Plan, RPU will continue to accumulate larger amounts of data. Therefore, staff recognized the need to move away from storing data in various formats and disparate systems to a streamlined system of collecting, analyzing, visualizing and sharing large amounts of historical, real-time and time series data from multiple sources with people and systems across all operations.

In April 2016, the Board of Public Utilities (Board) approved implementation of the OSIsoft PI System (PI) to serve as RPU's ODMS. PI integrates previously nonintegrated data and transforms it into meaningful information that can be displayed and consumed through visual tools such as dashboards and reports (as represented in Figure 2 below). In addition to providing readily available and easy to consume information, PI provides an enhanced analytics platform that RPU can leverage to improve operational performance. Thirty-five separate software systems have been integrated with PI thus far (as listed in Table 3 on page 6).

FIGURE 2 – PI System Data Hub



Utilizing PI, RPU has been able to significantly improve operational efficiencies, reduce staff time and operating costs, and improve asset management and system reliability. Additionally, RPU has benefited in several other ways, including:

- Increased visibility into systems and assets
- Improved ability to monitor and track performance to support operating decisions
- Improved ability to analyze incidents to determine cause and effect for establishing corrective actions
- Better enterprise-wide decision making, driven by real-time data
- Automation of multiple manual workflow processes
- Reduced risks and costs associated with potential equipment failure
- Optimized operational processes
- Improved asset maintenance and field workforce management

- Increased proactive (predictive) operations to optimize the cost of operating the distribution system
- Improved analytics of historical data for better capital improvement and resources planning
- Improved ability to capture data and produce timely and accurate mandatory compliance reports (required for utilities by North American Electric Reliability Corporation, United States Environmental Protection Agency, California Independent System Operator, etc.)
- Improved real-time methods for monitoring market activity and optimizing bidding strategies

On April 30, 2019, staff published a progress report, "Status Update: Operational Data Management System", showing that since implementing PI, RPU had achieved a return on investment (ROI) of nearly $673,000 per year as shown in Table 1.

TABLE 1 – Total Annual Return on Investment (ROI) as of 4/30/19

DASHBOARD	ANNUAL ROI
Water Operations Work Order and Preventative Maintenance Dashboards	$112,589
Water Operations / System Demands Dashboards	$62,161
Water Lab Data Dashboard	$4,605
Blend Summary Dashboard	$46,049
Water Well Flow Rates Dashboard	$25,393
Water Wells Mobile	$11,248
Physical Security Maps	$4,599
SCADA Validation Report	$12,580
Booster Station Dashboards	$31,293
Water Field Work Order Map	$95,859
Water Field Service Request Map	$47,240
Outage Map	$18,157
Electric Grid Sensor Map and Dashboards	$21,243
Volt-VAR Analysis Dashboard	$58,248
SCADA Data in Synergi	$7,310
Electric Substation Map	$3,956
Streetlight Service Requests Dashboard	$6,132
Real-Time Spreadsheet	$66,060
Vista Load and Generation Dashboard	$16,744
Call Center Dashboards	$3,360
Overtime Reports and Dashboards	$18,017
TOTAL RETURN ON INVESTMENT AS OF 4/30/19	**$672,843**

Since publishing the 2019 report, staff has continued to develop dashboards and reports that have continued to increase the return on investment for the PI system. From May 1, 2019 to December 31, 2020, RPU achieved an additional return on investment of $640,027, as shown in Table 2 below.

TABLE 2: Total Additional Annual Return on Investment (ROI) from 5/1/19 – 12/31/20

DASHBOARD	DESCRIPTION	ANNUAL ROI
Automated Daily Gallons Per Minute (GPM) vs Totalizer Report	Compares flow rate versus totalizer on meters	$1,175
Contact Time and Turbidity Reporting	Adds PI Data Link date to month end reports	$2,585
Water Operations Ad-HOC Data Requests	Automates data requests from RPU Finance	$1,077
Well Starts	Tracks how many times a well turns on in a defined time frame	$646
Capital Improvement Projects / Work Orders Map	Workorder integration with GIS	$26,184
Sunnyside Riverside Water Treatment Plant Monthly Report	Integrates Data Link data into existing report	$427
Real-Time Spreadsheet Addition	Additional enhancement to previously developed Real-Time Spreadsheet	$139,344
Automated Daily Power Supply Financials	Monitors negative daily market costs	$6,548
SCADA Hour Ending Data Download	SCADA data used to estimate RERC and Tequesquite hourly generation output; backup for SCADA Historian	$34,455
Springs Generation Load Data	Springs generation data used to estimate hourly generation output	$864
Clearwater Generation Data / Dashboard	Clearwater generation data used to estimate hourly generation output.	$1,413
Real Time Renewable Data Integration	Automates hourly RT renewable data in PI	$40,967
PI Counters using Wonderware	Environmental Permit Conditions require specific tests to be performed based on operational hours each quarter. Monitoring helps with scheduling units to operate to complete these tests.	$2,749
CAISO Meter Data	Viewing and comparing Vista meter data to SCADA data during issues	$135
Pattern Recognition Technologies, Inc. (PRT) Data	PRT data is used to forecast hourly load and temps to meet demand on an hourly and daily basis	$170,697
Oasis Prices	Comparing market prices with forecasted demands and renewables	$102,418
Customer Market Results Interface (CMRI)	Opportunity cost, two day ahead forecast, daily electricity price index, and variable energy resources forecast	$9,673
SoCal Gas Envoy Meter Data	Data collected daily from SoCal Gas	$6,259
Daily Runtimes for Clearwater Generation and Springs Generation	Automates previously manual and tedious runtime reports	$54,623

Breaker Status Notification	Provides alarms for grid issues and status of feeders	$5,184
Celltraq Dashboard	Consolidated view of the entire substation battery fleet, making ranking the battery condition easier and prioritizing replacements; provides data for PRC-005 NERC compliance	$2,059
Water Field Work Order History Map	Daily use of researching water infrastructure, WO information, customer information/history.	$30,545
TOTAL ADDITIONAL ANNUAL RETURN ON INVESTMENT FROM 5/1/19 – 12/31/20		**$640,027**

These ROI calculations are based on quantitative factors. The primary quantitative factor in each instance is the reduction in staff time to complete tasks. The ROI is calculated using an average hourly rate of the staff position responsible for the task adjusted by a payroll burden multiplier[1] for electric and water of 1.682 and 1.743, respectively. The adjusted total hourly value of the staff position is then multiplied by the hours saved in a year.

It should be noted that other quantitative benefits have also been realized that are not specifically calculated in the ROI, such as reduced truck rolls to investigate problems, reduced overtime costs, reduced operating costs, and reduced paper waste. Staff currently cannot assign an exact value to these benefits, even though these benefits are believed to be material. Also, there are numerous qualitative benefits being derived from the system, which are more difficult to calculate as tangible savings. These savings include increased visibility into system status, avoided costs of potential regulatory fines or lawsuits, reduced length of system outages, fewer customer complaints, and improved system planning.

RPU has invested a total of $4,907,000 (through July 2021) into implementing and deploying the PI System. This investment includes the purchasing of hardware and software; a comprehensive enterprise license and services agreement with OSIsoft; City Innovation and Technology Department labor to support back-end implementation of the system; and professional contract services to support system integration, data migration and the development of dashboards and reports.

As outlined in the tables above, the total combined annual ROI is $1,312,870 per year. This far surpassed the annual enterprise service cost of the OSIsoft PI system, which averaged $298,210 a year for the initial 5-year contract period. At this time, RPU is requesting to renew the enterprise agreement with OSIsoft for an additional 5-year term, through August 14, 2026. The average annual cost for the new 5-year term is $242,466 per year.

Over the next several years, RPU plans to continue developing and expanding the use of PI for additional operational benefits, efficiencies, and ROI. In addition, there are many new dashboards and reports that will be developed using the data from the existing integrations, such as in-depth grid sensor multi-phase reporting and real-time renewables analysis. Staff also plans to integrate the Customer Information System and the new Advanced Meter Infrastructure (AMI) system with PI following the AMI roll-out process, to facilitate improved reporting and analysis of meter data, system performance, operational efficiencies, outage detection and resolution, and customer interaction metrics.

[1] Payroll burden multipliers for electric and water provided by Finance and Administration based on the fiscal year 2019-2020 Summary of Overhead Rate information.

TABLE 3 – System Integrations performed to date

INTEGRATION	DESCRIPTION / DATA
Kapsch Dynac Water Supervisory Control and Acquisition (SCADA)	Water operations data
Oracle Utility Work and Asset Management (UWAM) – 2 separate integrations	Work order, service request and asset data
WaterTrax Data and Compliance Management Software	Water quality data
Ingenu Grid Sensor Devices	Grid sensor data
National Oceanic and Atmospheric Administration (NOAA) website	Weather data for Riverside Municipal Airport and March Air Reserve Base
California Irrigation Management Information System (CIMIS) website	Weather data for University of California, Riverside (UCR)
Delta-X Research Transformer Oil Analyst (TOA)	Substation transformer test data
ENOSERV PowerBase	Substation switch gear and relay maintenance data
Midtronics Celltraq System	Substation battery test data
Open Systems International Electric SCADA / Chronus Historian	Electric operations data
Outage Management and Reporting Database	Electric outage data
Statistical Analysis Software (SAS)	Data analytics
SettleCore DealCapture - 3 separate integrations	Load data, natural gas consumption, and Operational Flow Order (OFO) notices
California Independent System Operator OASIS website	Real-time and day-ahead price and load market data
Avaya Call Management System	Real-time call center data
Integrated Financial and Administrative Solution (IFAS)	Payroll data (replaced by One Solution)
One Solution	Payroll data
Motorola Radio/CompassCom	Hand-held and mobile radio location data
DNV-GL Synergi	Power distribution system and electrical simulation
Oracle Seibel Customer Relationship Management (CRM)	Service request data
WonderWare Generation SCADA and Historian	Generation operations data
Happy or Not	Customer satisfaction data
ESRI ArcGIS Portal	Map data
ESRI ArcGIS Online	Map data
Microsoft SQL	Data integration
AirNow.Gov Riverside Air quality	Air Quality Index, Ozone, Particles
Substation RTAC	Primex, Oil temperature, weather, etc.
CAISO CMRI	Market Awards, Market Price etc.
Market Ops FTP data	Renewables ADSRI, ADRSII, Kingbird etc.
Market Ops - Renewables	Store 5 minute and hourly load readings from various renewable sources (Example: Banning, Kingbird, SummerSolar etc.)

Pump Runtime	Booster pump runtime calculation for condition-based asset maintenance
Market Ops Load calculation	Hourly load demand calculation using current system load and total generation
PRT	Automatically upload hourly electric load to accurately calculate Electricity Demand Forecast
OASIS New Integrations	Store OASIS data in PI
SIBR	Store CAISO SIBR settlement data in PI