OPERATIONAL DATA MANAGEMENT SYSTEM PROJECT UPDATE AND STAFF REPORT

Riverside Public Utilities

Board of Public Utilities
June 10, 2019

BACKGROUND – STRATEGIC TECHNOLOGY PLAN

CUSTOMER-FOCUSED — Directly influence customer experience and provide customer interaction

1. Customer Information System (CIS)
2. Customer Relationship Management (CRM)
3. Interactive Voice Response (IVR)
4. Customer Web Portal (CWP)

INFORMATION-BASED — Provide decision and analysis, data management and process implementation (primarily large databases)

5. Asset Management System (AMS)
6. Work Management System (WMS)
7. Warehouse Inventory System (WIS)
8. Geographic Information System (GIS)
9. Mobile Applications (Mobile Apps)
10. Operational Data Management System (ODMS)

OPERATIONAL — Provide real-time operation and control of water and energy delivery systems

11. Network Communications System (NCS)
12. Land Mobile Radio (LMR)
13. Advanced Metering Infrastructure (AMI)
14. Meter Data Management System (MDMS)
15. Automatic Vehicle Location (AVL)
16. Distribution Automation (DA)
17. Substation Automation (SA)
18. Outage Management System (OMS)
19. Supervisory Control and Data Acquisition (SCADA) and Advanced Distribution Management System (ADMS)

OTHER — Additional projects identified after Strategic Technology Plan was issued

20. Dark Fiber
21. Talent Management System
22. LED Street Lights

CYBER SECURITY

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BACKGROUND

1. All divisions within RPU rely on data to make operational and fiscal decisions
2. Thousands of data points are collected daily
3. RPU recognized need to move away from storing data in various formats and disparate systems
4. In response to need, Board of Public Utilities approved OSIsoft Pi System to serve as ODMS for entire utility (April 2016)

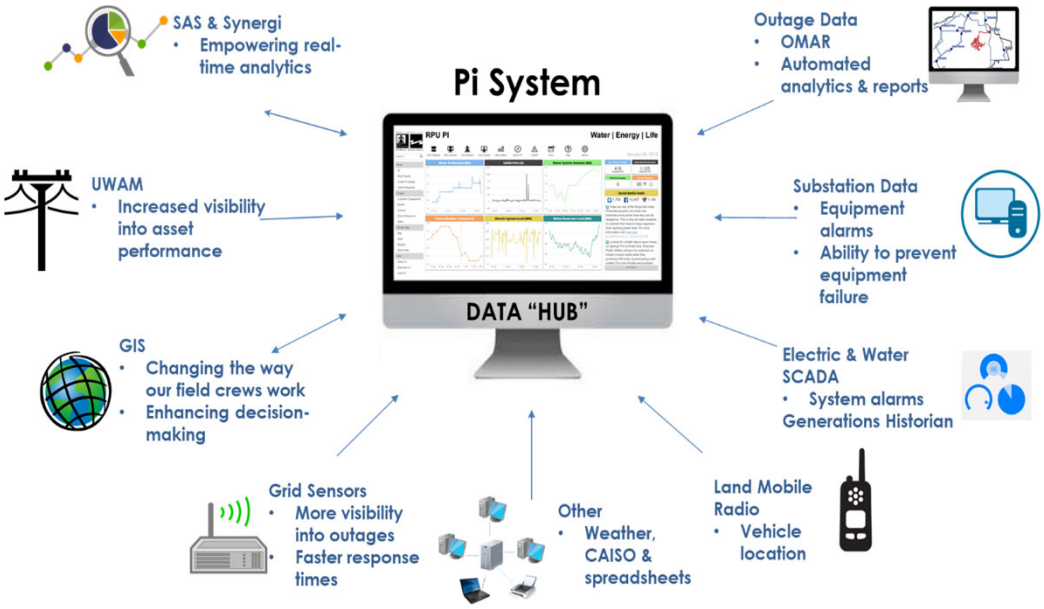
WHAT IS THE OSI PI SYSTEM?

1. Serves as a "data hub" or central data repository
2. Integrates previously nonintegrated data from disparate systems
3. Provides an enhanced analytics platform that utility can leverage to improve operational performance

WHAT IS THE OSI PI SYSTEM? (Cont'd)

4. Allows managers and staff to:
   a. Collect, analyze, visualize and share large amounts of historical, real-time, and time series operational data
   b. Manage and share large amounts of data across multiple systems and workgroups
   c. Transform data into meaningful information through dashboards and reports to drive critical business decisions

PI SYSTEM – DATA HUB



EXAMPLES OF PI SYSTEM BENEFITS

1. Improved operational efficiencies
2. Reduced staff time by automating processes
3. Increased visibility into systems and assets
4. Improved system reliability
5. Reduced operating costs
6. Advanced methods for monitoring market activity
7. Optimizing bidding strategies

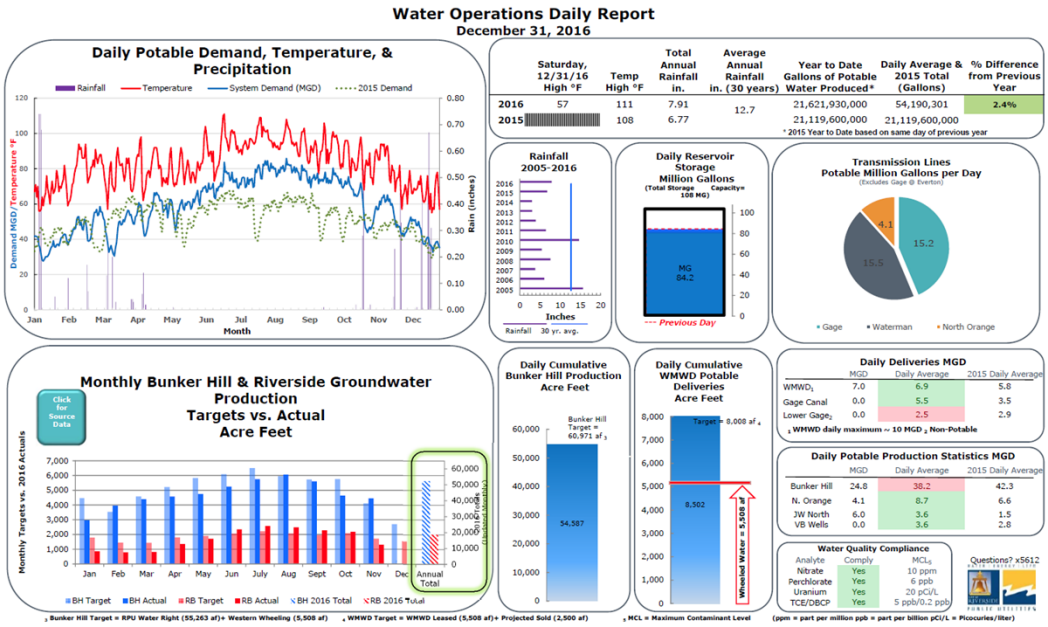
IMPLEMENTATION/ON-GOING COST

1. RPU has invested $4,907,000 into implementing and deploying the Pi System, which includes:
   a. Hardware and software
   b. OSIsoft enterprise license and services agreement
      i. Annual services fee is $347,000 per year through July 2019
      ii. Reduces to $225,026 until July 2021
   c. City IT labor to support back-end implementation
   d. Professional contract services as "extension-of-staff"

RETURN ON INVESTMENT (ROI)

1. Since implementing Pi, RPU has achieved ROI of over $672,843 per year
2. Surpasses annual enterprise service cost of OSI Pi system
3. New development is concurrently underway that should increase ROI to over $800,000 in next year

WATER OPERATIONS DASHBOARD – PRIOR STATE



PRIOR STATE - SCADA DATA DOWNLOAD

Time	RESERVOIR points/RESTOTAL	WATERMAN WELLS points/R041FI1TOTAL	GARNER B points/R021FLOWTOT	GARNER C points/R022FLWTOT	GARNER D points/R023FLOWTOT
12/14/15 12:00 AM	87515048	2329124	1803192	342773	1831967
12/14/15 1:00 AM	87491520	2329202	1803284	342773	1831967
12/14/15 2:00 AM	87486800	2329280	1803376	342773	1831967
12/14/15 3:00 AM	87202728	2329358	1803468	342773	1831967
12/14/15 4:00 AM	86810568	2329436	1803560	342773	1831967
12/14/15 5:00 AM	86649176	2329514	1803651	342773	1831967
12/14/15 6:00 AM	86581776	2329593	1803742	342773	1831967
12/14/15 7:00 AM	86534392	2329671	1803833	342773	1831967
12/14/15 8:00 AM	86664640	2329748	1803925	342773	1831967
12/14/15 9:00 AM	86998768	2329827	1804017	342773	1831967
12/14/15 10:00 AM	87244784	2329905	1804109	342773	1831967
12/14/15 11:00 AM	87636840	2329983	1804201	342773	1831967
12/14/15 12:00 PM	88031360	2330061	1804293	342773	1831967
12/14/15 1:00 PM	88374232	2330139	1804384	342773	1831967
12/14/15 2:00 PM	88745960	2330215	1804476	342773	1831967
12/14/15 3:00 PM	89196304	2330293	1804567	342773	1831967
12/14/15 4:00 PM	89451472	2330371	1804658	342773	1831967
12/14/15 5:00 PM	89588120	2330449	1804750	342773	1831967
12/14/15 6:00 PM	89664688	2330527	1804841	342773	1831967
12/14/15 7:00 PM	89482056	2330606	1804932	342773	1831967
12/14/15 8:00 PM	89161888	2330684	1805023	342773	1831967
12/14/15 9:00 PM	88717064	2330762	1805114	342773	1831967
12/14/15 10:00 PM	88431480	2330839	1805205	342773	1831967
12/14/15 11:00 PM	88238008	2330917	1805296	342773	1831967
12/15/15 12:00 AM	88103736	2330995	1805388	342773	1831967

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PRIOR STATE - DATA MANIPULATION

Date	Day of Year	Temperature	Precipitation	Gage - Bunker Hill	Deberry + Van Buren Well (flowing to Gage)	Total Gage Production (mgd)	Waterman Wells
01/01/15	1	54	0.00	14.7	3.8	18.5	12.4
01/02/15	2	60	0.00	14.6	3.8	18.4	14.5
01/03/15	3	61	0.00	14.6	3.8	18.4	13.9
01/04/15	4	69	0.00	14.5	3.8	18.3	15.0
01/05/15	5	76	0.00	13.3	3.8	17.1	20.3
01/06/15	6	81	0.00	13.1	3.8	16.9	28.4
01/07/15	7	81	0.00	12.3	3.7	16.0	29.7
01/08/15	8	74	0.00	13.1	3.7	16.8	29.6
01/09/15	9	65	0.00	14.6	3.8	18.3	18.9
01/10/15	10	65	0.00	14.9	3.8	18.6	13.0
01/11/15	11	59	0.20	14.2	3.8	18.0	14.4
01/12/15	12	64	0.01	14.1	3.8	17.9	12.6
01/13/15	13	67	0.00	13.8	3.8	17.5	10.6
01/14/15	14	69	0.00	14.8	3.7	18.5	12.4
01/15/15	15	72	0.00	14.7	3.7	18.4	13.0
01/16/15	16	77	0.00	14.7	3.7	18.4	17.5
01/17/15	17	80	0.00	14.6	3.7	18.3	19.9
01/18/15	18	76	0.00	14.6	3.7	18.3	15.5
01/19/15	19	74	0.00	14.7	3.7	18.4	16.4
01/20/15	20	67	0.00	14.5	3.7	18.3	19.8
01/21/15	21	72	0.00	14.4	3.7	18.2	16.5
01/22/15	22	75	0.00	14.1	3.7	17.8	14.9
01/23/15	23	73	0.00	13.5	3.7	17.2	21.4

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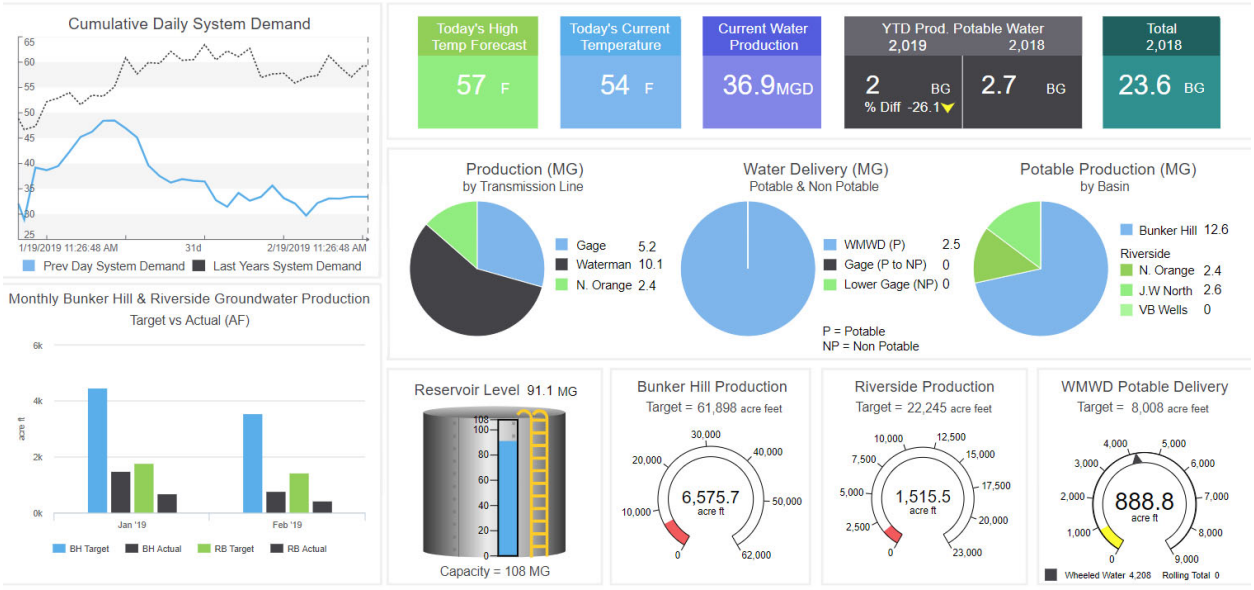
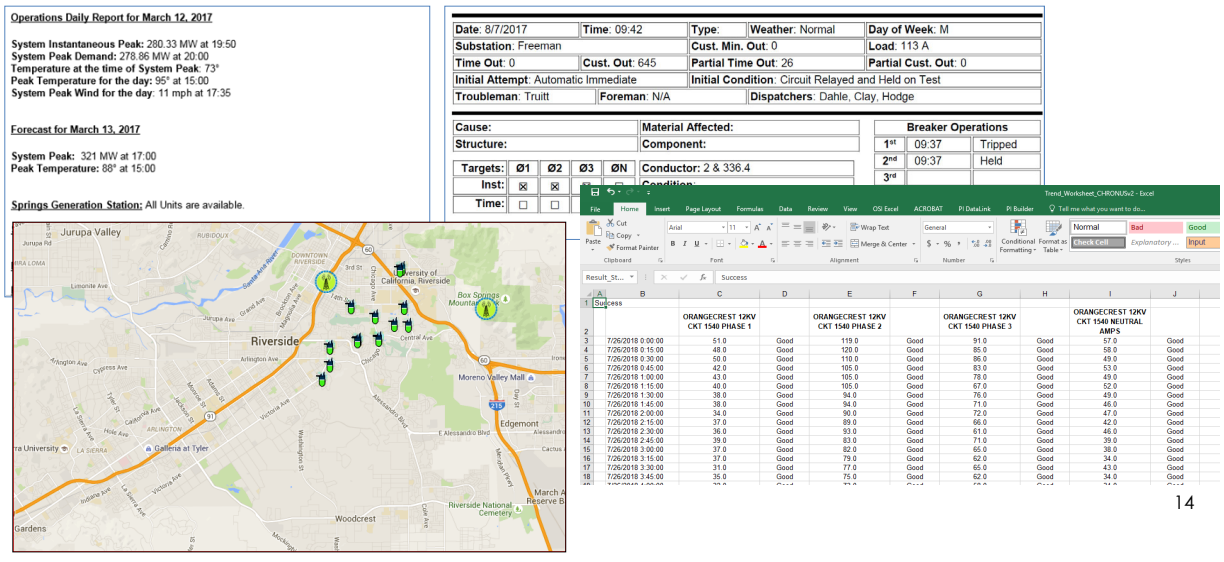
WATER OPERATIONS DASHBOARD IN PI



ENERGY DELIVERY DASHBOARD – PRIOR STATE



Operations Daily Report for March 12, 2017

System Instantaneous Peak: 280.33 MW at 19:50
System Peak Demand: 278.86 MW at 20:00
Temperature at the time of System Peak: 73°
Peak Temperature for the day: 95° at 15:00
System Peak Wind for the day: 11 mph at 17:35

Forecast for March 13, 2017

System Peak: 321 MW at 17:00
Peak Temperature: 88° at 15:00

Springs Generation Station: All Units are available.

Date: 8/7/2017	**Time:** 09:42	**Type:**	**Weather:** Normal	**Day of Week:** M
Substation: Freeman			**Cust. Min. Out:** 0	**Load:** 113 A
Time Out: 0	**Cust. Out:** 645		**Partial Time Out:** 26	**Partial Cust. Out:** 0
Initial Attempt: Automatic Immediate			**Initial Condition:** Circuit Relayed and Held on Test	
Troubleman: Truitt		**Foreman:** N/A	**Dispatchers:** Dahle, Clay, Hodge	

Cause:		**Material Affected:**		
Structure:		**Component:**		
Targets:	Ø1	Ø2	Ø3	ØN
Inst:	☒	☒		
Time:	☐	☐		

Conductor: 2 & 336.4
Condition:

Breaker Operations		
1st	09:37	Tripped
2nd	09:37	Held
3rd		

	ORANGECREST 12KV CKT 1540 PHASE 1		ORANGECREST 12KV CKT 1540 PHASE 2		ORANGECREST 12KV CKT 1540 PHASE 3		ORANGECREST 12KV CKT 1540 NEUTRAL AMPS
7/26/2018 0:00:00	51.0	Good	119.0	Good	91.0	Good	57.0
7/26/2018 0:15:00	48.0	Good	120.0	Good	85.0	Good	58.0
7/26/2018 0:30:00	50.0	Good	110.0	Good	86.0	Good	49.0
7/26/2018 0:45:00	42.0	Good	105.0	Good	83.0	Good	53.0
7/26/2018 1:00:00	43.0	Good	105.0	Good	78.0	Good	49.0
7/26/2018 1:15:00	40.0	Good	105.0	Good	67.0	Good	52.0
7/26/2018 1:30:00	38.0	Good	94.0	Good	76.0	Good	49.0
7/26/2018 1:45:00	38.0	Good	94.0	Good	71.0	Good	46.0
7/26/2018 2:00:00	34.0	Good	90.0	Good	72.0	Good	47.0
7/26/2018 2:15:00	37.0	Good	89.0	Good	66.0	Good	42.0
7/26/2018 2:30:00	36.0	Good	93.0	Good	61.0	Good	46.0
7/26/2018 2:45:00	39.0	Good	83.0	Good	71.0	Good	39.0
7/26/2018 3:00:00	37.0	Good	82.0	Good	65.0	Good	38.0
7/26/2018 3:15:00	37.0	Good	79.0	Good	62.0	Good	34.0
7/26/2018 3:30:00	31.0	Good	77.0	Good	65.0	Good	43.0
7/26/2018 3:45:00	35.0	Good	75.0	Good	62.0	Good	34.0

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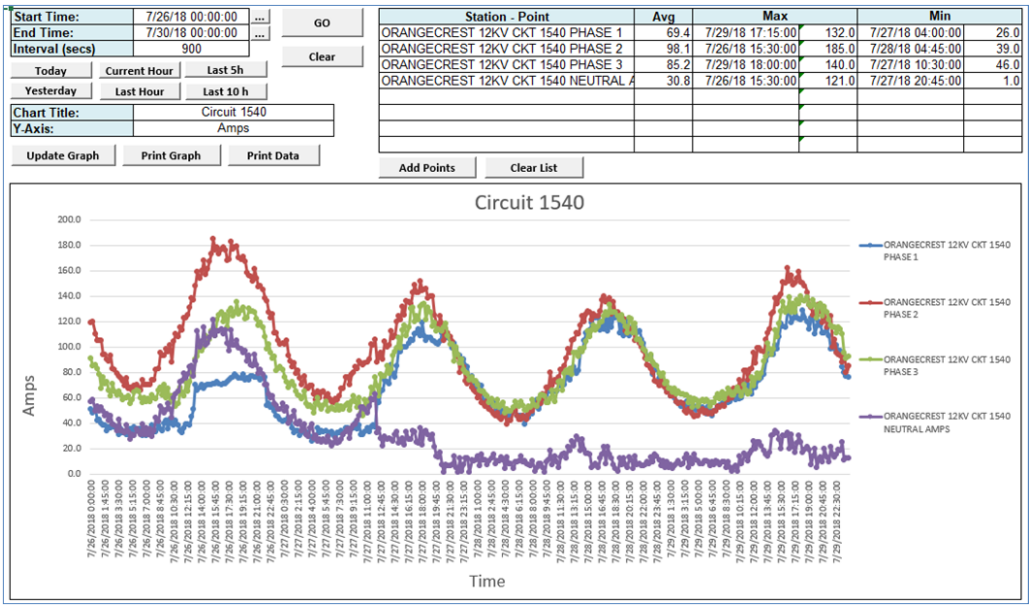
SCADA SYSTEM HISTORIAN – PRIOR STATE



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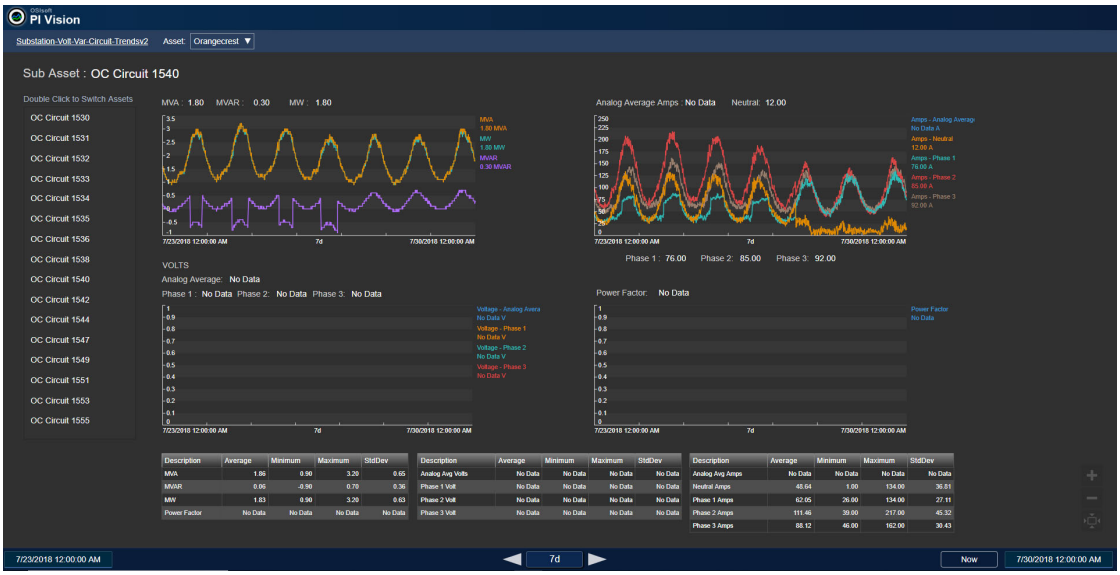
PLANNING SYSTEM HISTORIAN IN PI



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OUTAGE IDENTIFICATION – PRIOR STATE

Date: 8/7/2017	**Time**: 09:42	**Type**:	**Weather**: Normal	**Day of Week**: M
Substation: Freeman		**Cust. Min. Out**: 0		**Load**: 113 A
Time Out: 0	**Cust. Out**: 645	**Partial Time Out**: 26		**Partial Cust. Out**: 0
Initial Attempt: Automatic Immediate		**Initial Condition**: Circuit Relayed and Held on Test		
Troubleman: Truitt	**Foreman**: N/A	**Dispatchers**: Dahle, Clay, Hodge		

Cause:	**Material Affected:**
Structure:	**Component:**

Targets:	**Ø1**	**Ø2**	**Ø3**	**ØN**
Inst:	☒	☒	☒	☐
Time:	☐	☐	☐	☐

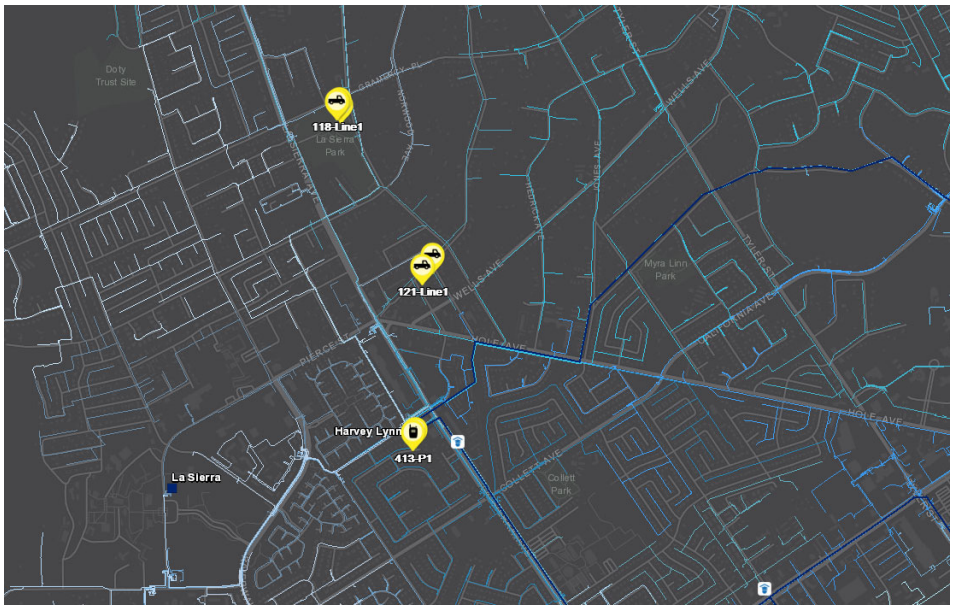
Conductor: 2 & 336.4

Condition:

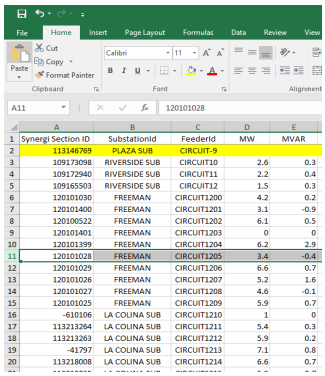
Ø1	Ø3
Ø2	ØN

Breaker Operations		
1st	09:37	Tripped
2nd	09:37	Held
3rd		
4th		
5th		
6th		

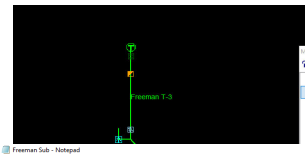
OUTAGE IDENTIFICATION MAP IN PI

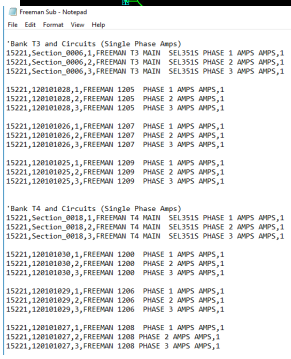


REAL-TIME ANALYSIS IN PI



Synergi Section ID	SubstationId	FeederId	MW	MVAR
113146769	PLAZA SUB	CIRCUIT-9		
109173098	RIVERSIDE SUB	CIRCUIT10	2.6	0.3
109172940	RIVERSIDE SUB	CIRCUIT11	2.2	0.4
109165503	RIVERSIDE SUB	CIRCUIT12	1.5	0.3
120101030	FREEMAN	CIRCUIT1200	4.2	0.2
120101400	FREEMAN	CIRCUIT1201	3.1	-0.9
120100522	FREEMAN	CIRCUIT1202	6.1	0.5
120101401	FREEMAN	CIRCUIT1203	0	0
120101399	FREEMAN	CIRCUIT1204	6.2	2.9
120101028	FREEMAN	CIRCUIT1205	3.4	-0.4
120101029	FREEMAN	CIRCUIT1206	6.6	0.7
120101026	FREEMAN	CIRCUIT1207	5.2	1.6
120101027	FREEMAN	CIRCUIT1208	4.6	-0.1
120101025	FREEMAN	CIRCUIT1209	5.9	0.7
-610106	LA COLINA SUB	CIRCUIT1210	1	0
113213264	LA COLINA SUB	CIRCUIT1211	5.4	0.3
113213263	LA COLINA SUB	CIRCUIT1212	5.9	0.2
-41797	LA COLINA SUB	CIRCUIT1213	7.1	0.8
113218008	LA COLINA SUB	CIRCUIT1214	6.6	0.7





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'Bank T3 and Circuits (Single Phase Amps)
15221,Section_0006,1,FREEMAN T3 MAIN  SEL351S PHASE 1 AMPS AMPS,1
15221,Section_0006,2,FREEMAN T3 MAIN  SEL351S PHASE 2 AMPS AMPS,1
15221,Section_0006,3,FREEMAN T3 MAIN  SEL351S PHASE 3 AMPS AMPS,1

15221,120101028,1,FREEMAN 1205  PHASE 1 AMPS AMPS,1
15221,120101028,2,FREEMAN 1205  PHASE 2 AMPS AMPS,1
15221,120101028,3,FREEMAN 1205  PHASE 3 AMPS AMPS,1

15221,120101026,1,FREEMAN 1207  PHASE 1 AMPS AMPS,1
15221,120101026,2,FREEMAN 1207  PHASE 2 AMPS AMPS,1
15221,120101026,3,FREEMAN 1207  PHASE 3 AMPS AMPS,1

15221,120101025,1,FREEMAN 1209  PHASE 1 AMPS AMPS,1
15221,120101025,2,FREEMAN 1209  PHASE 2 AMPS AMPS,1
15221,120101025,3,FREEMAN 1209  PHASE 3 AMPS AMPS,1


'Bank T4 and Circuits (Single Phase Amps)
15221,Section_0018,1,FREEMAN T4 MAIN  SEL351S PHASE 1 AMPS AMPS,1
15221,Section_0018,2,FREEMAN T4 MAIN  SEL351S PHASE 2 AMPS AMPS,1
15221,Section_0018,3,FREEMAN T4 MAIN  SEL351S PHASE 3 AMPS AMPS,1

15221,120101030,1,FREEMAN 1200  PHASE 1 AMPS AMPS,1
15221,120101030,2,FREEMAN 1200  PHASE 2 AMPS AMPS,1
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15221,120101027,1,FREEMAN 1208  PHASE 1 AMPS AMPS,1
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15221,120101027,3,FREEMAN 1208 PHASE 3 AMPS AMPS,1
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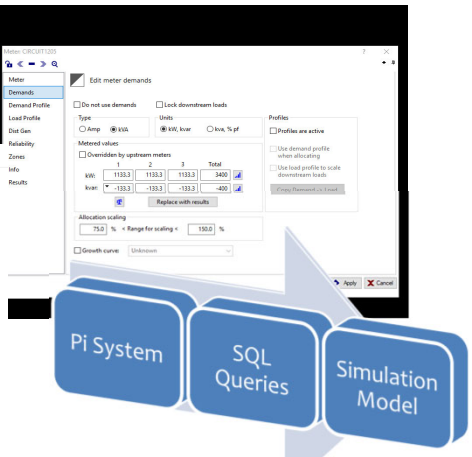

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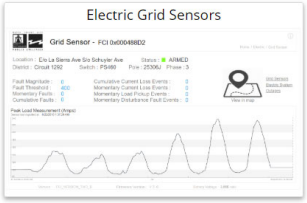
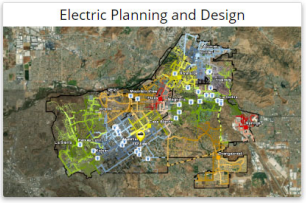
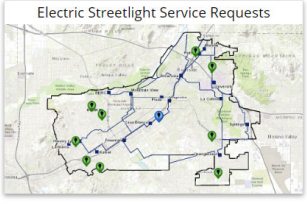
RiversidePublicUtilities.com

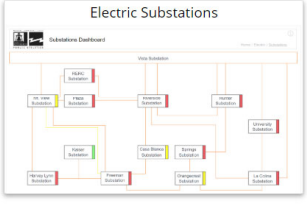
WATER | ENERGY | LIFE
CITY OF RIVERSIDE PUBLIC UTILITIES

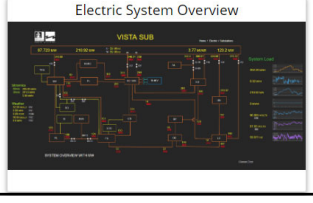
ENERGY DELIVERY DASHBOARD IN PI

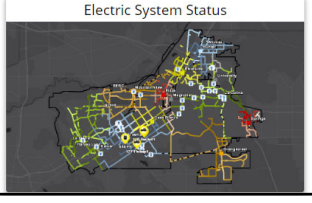


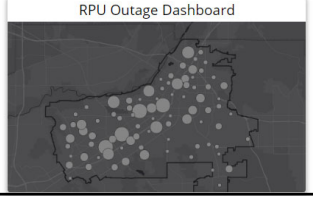












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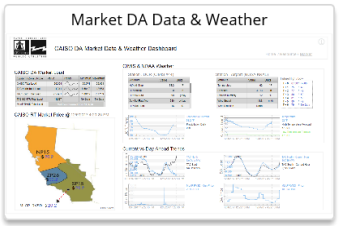
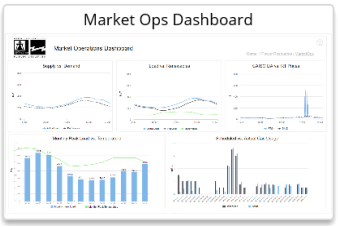
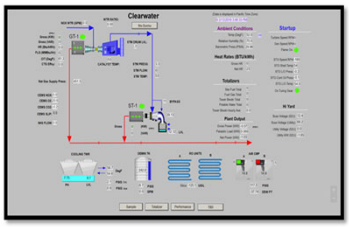
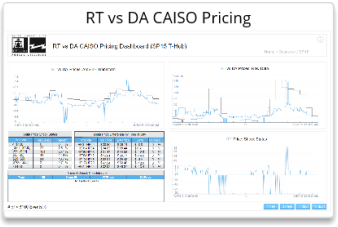
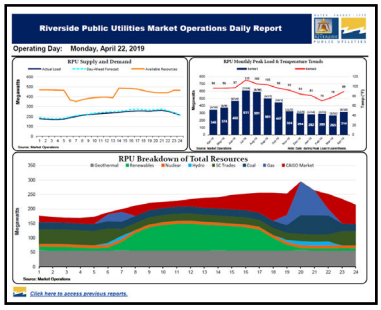
POWER RESOURCES – MARKET OPERATIONS











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FUTURE DEVELOPMENT

RPU plans to continue developing and expanding the use of the Pi system for additional operational benefits, efficiencies, and ROI including:

1. Pi Manual Logger
2. New dashboards and reports using the data from existing integrations
3. Integration with enQuesta Customer Information System
4. Integration with Advanced Meter Infrastructure / Meter Data Management System

RECOMMENDATION

That the Board of Public Utilities receive and file a project update and staff report on the Operational Data Management System.