OSIsoft®

USERS CONFERENCE 2016

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TRANSFORM YOUR WORLD

Utility Scale/Residential Solar Programs - APS

Presented by **Kurt Pager**
Katie Hoepfl

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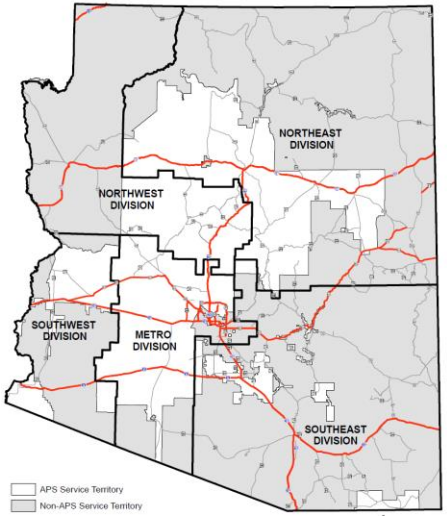
Who is aps?



- Serve over 1.2 million customers
- Largest IOU in Arizona
- Serving 11 of 15 Arizona counties
- Peak demand ~7,300 MW
- 6,000 miles of transmission
- 28,000 miles of distribution
- Over 36,000 sq. miles of territory

intelligentutility® WHERE THE SMART GRID MEETS BUSINESS AND REALITY → #4 Most Intelligent Utility

greentechmedia: → Top 10 in Smart Grid

20 YEARS SEPA solar electric power association → #4 in Solar Deployed

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APS Owned Solar Plants

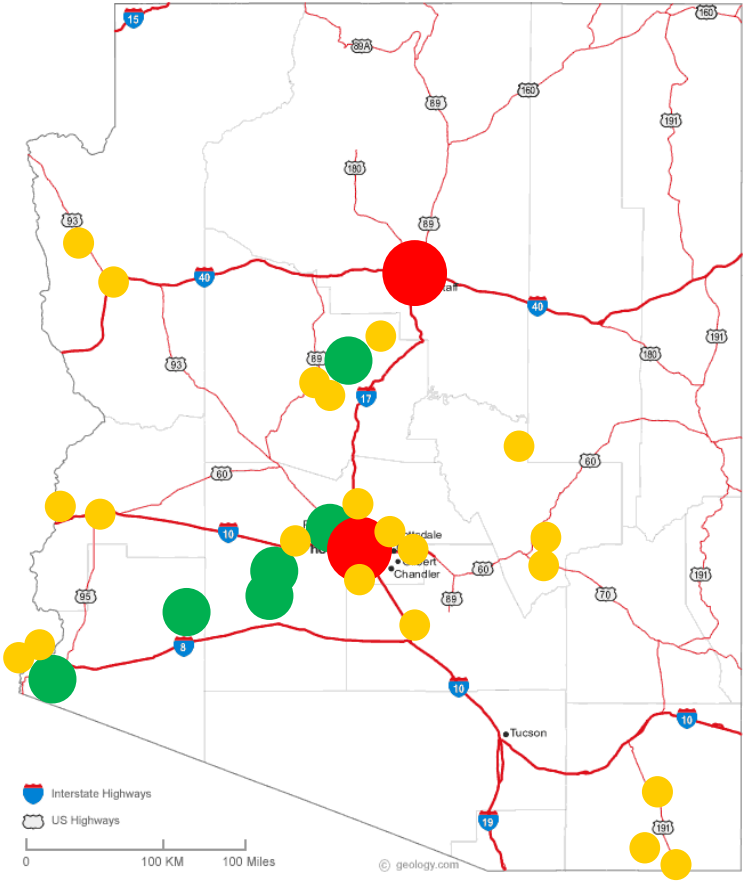
Utility Scale Plants (9 Plants)
(10 MW to 37 MW per Plant)

Schools & Government (59 Systems)
(27 kW to 440 kW Per Location)

Residential (>1000 Homes)
(1, 2 & 3 kW Systems)

Legacy (79 Systems)
(2 kW to 500 kW Systems)

- Utility Scale (Tier 1)
- Schools & Government (Tier 2)
- Residential (Tier 3)



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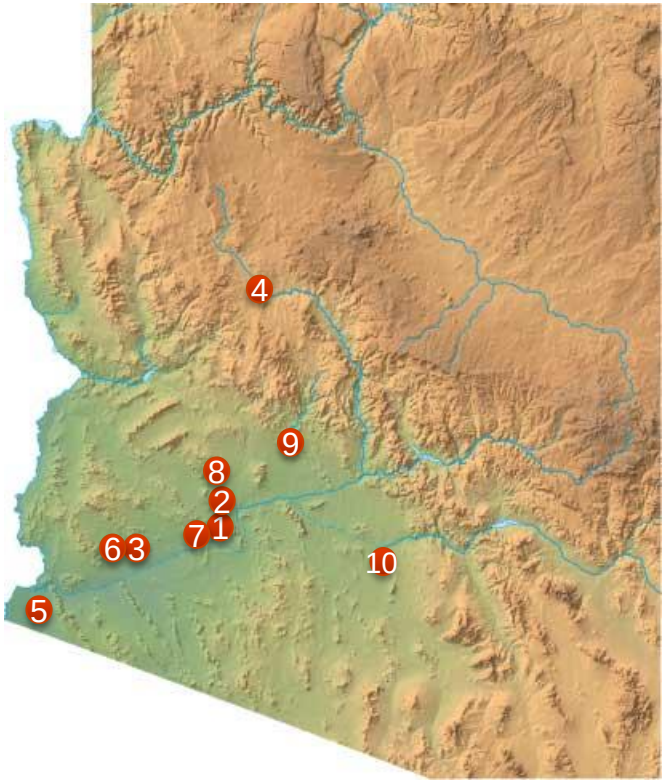
Utility Scale Solar



AZ Sun: Program to develop 210MW of APS-owned utility-scale solar PV

- 170 MW in-service
- 40 MW under construction

• **1 – Paloma** located in Gila Bend	17MW ac
• **2 – Cotton Center** located in Gila Bend	17MW ac
• **3 – Hyder I** located in Roll	16MW ac
• **4 – Chino Valley** located in Chino Valley	19MW ac
• **5 – Foothills** located in Yuma	35MW ac
• **6 – Hyder II** located in Roll	14MW ac
• **7 – Gila Bend** located in Gila Bend	32MW ac
• **8 – Desert Star** located in Gila Bend	10MW ac
• **9 – Luke AFB** located in Glendale	10MW ac
• **10 – *Red Rock*** located in Saguaro	*40MW ac*

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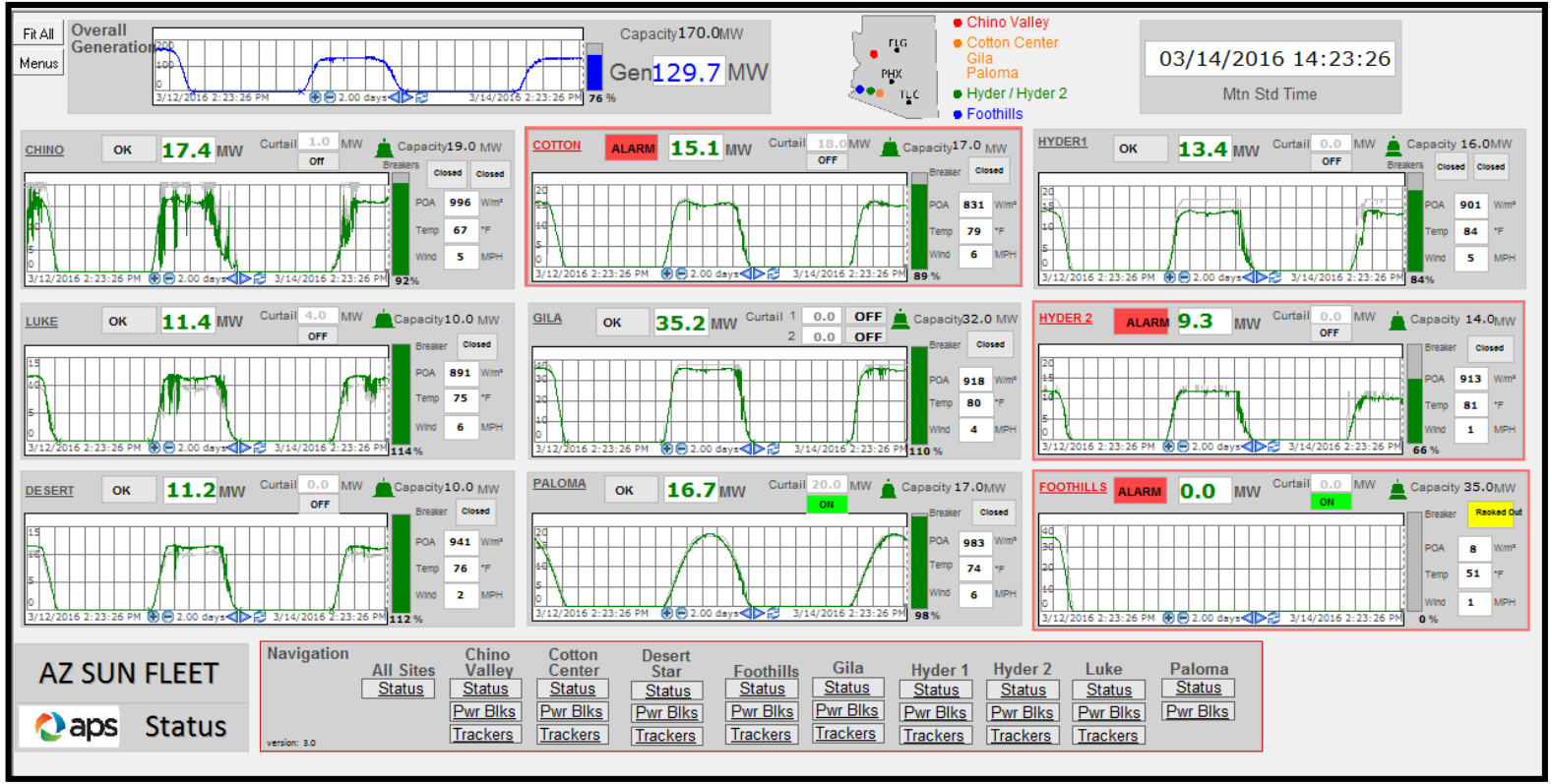
APS Utility Scale Solar Fleet in PI ProcessBook 2015



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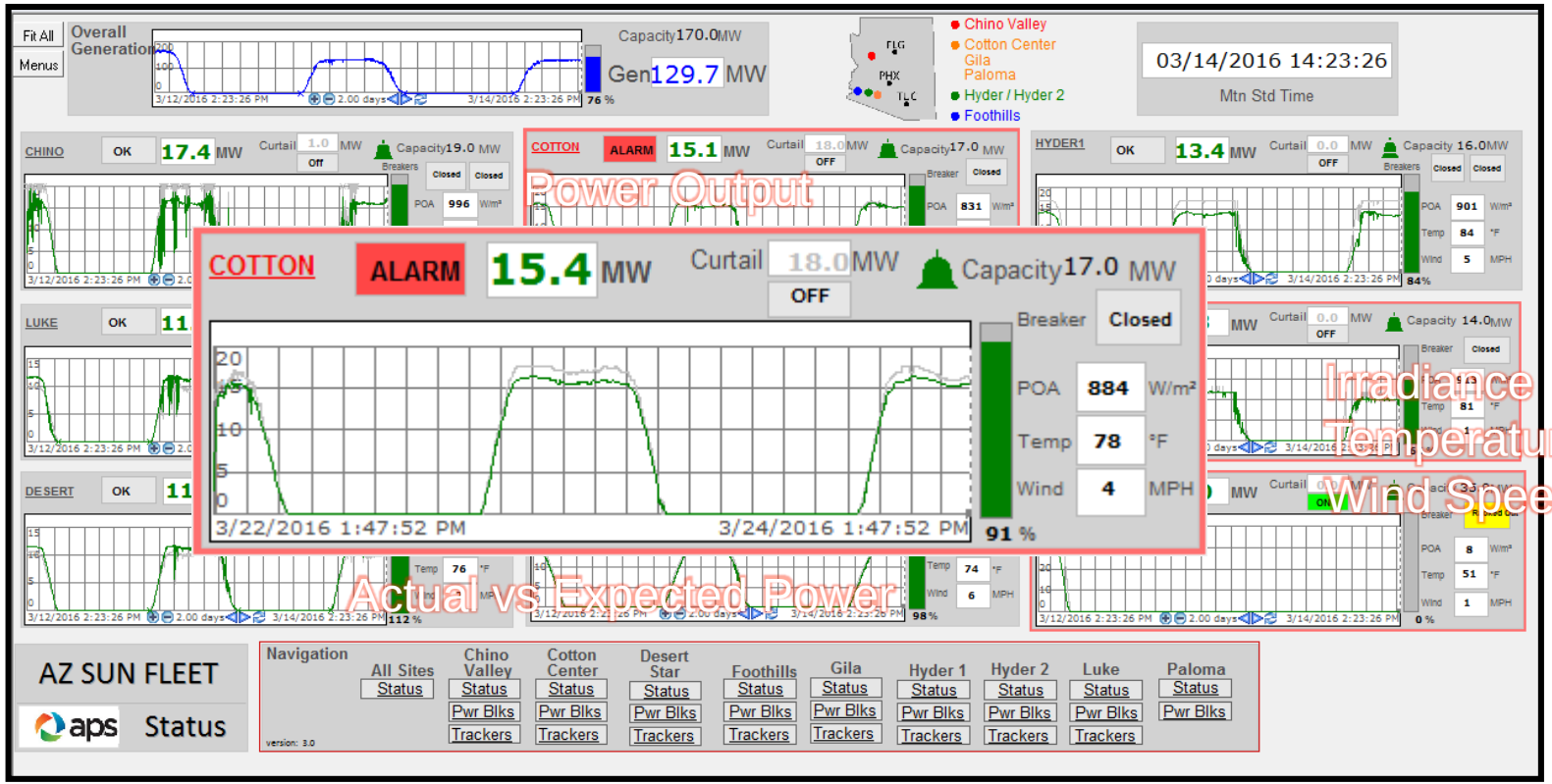
APS Utility Scale Solar Fleet in PI ProcessBook 2015



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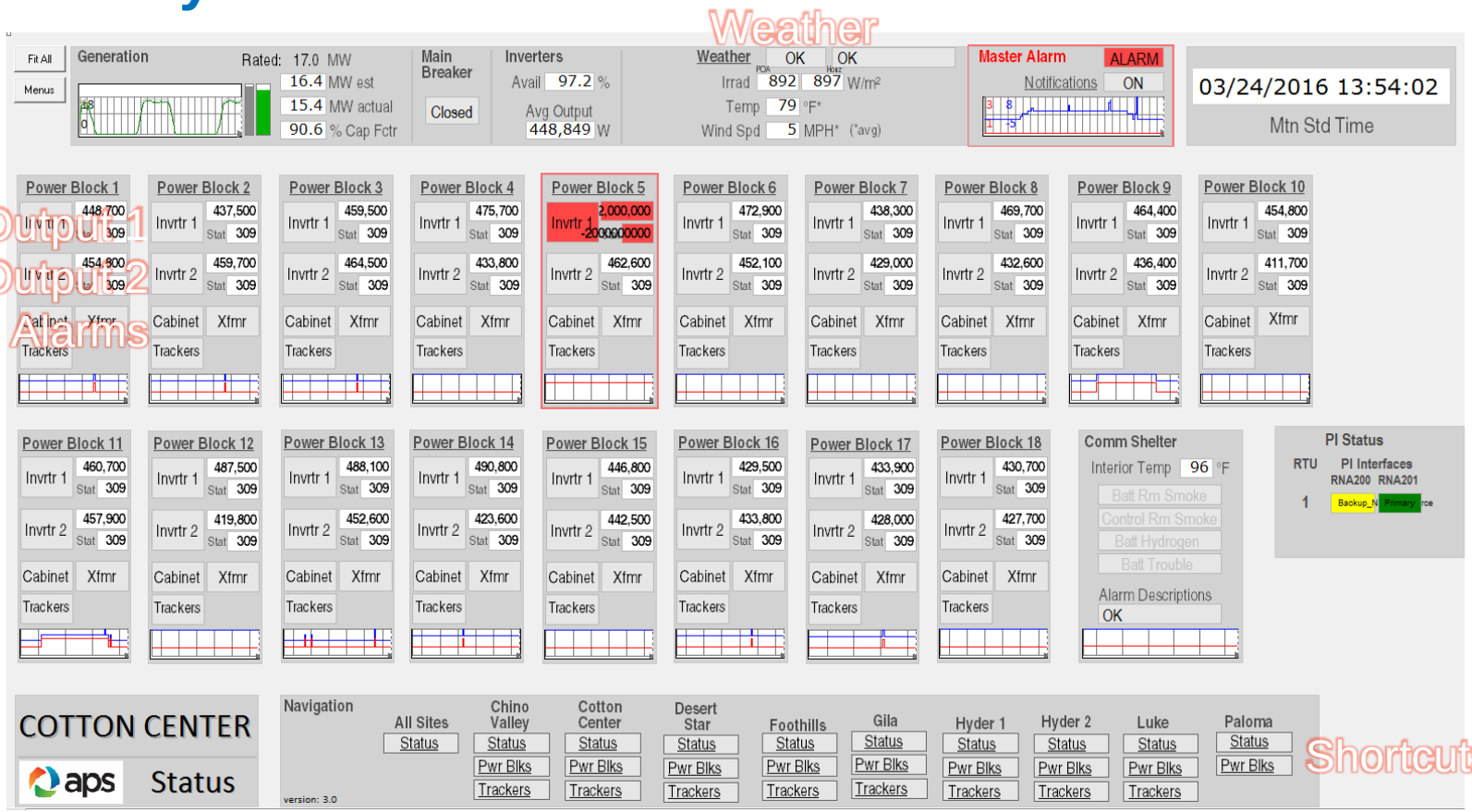
APS Utility Scale Solar Fleet in PI ProcessBook 2015



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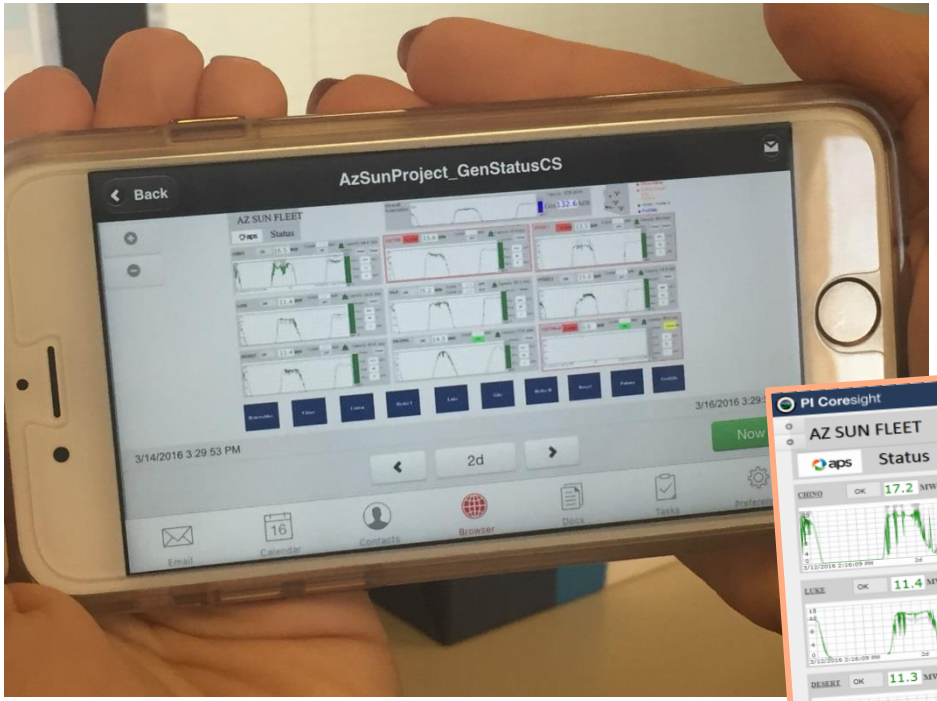
APS Utility Scale Solar Fleet on Smartphone



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What data is PI Server collecting from large solar sites?

- Solar Site – 300 to 400 acres of PV panels.
- 90,000+ Photovoltaic Panels per site.
- 1,000,000+ Photovoltaic Panels for all APS sites.
- 100 Tracker motors, Red Rock sites new design will 2,500 Tracker Motors.
- 20 plus large inverters. Volts, amps, frequency, temperatures.
- Transformers. Oil pressure, temperature, and level.

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Utility Scale Solar - PI System Technology

- PI Server
  - HA
  - Asset Framework
  - Notifications
- PI Interface for DNP3
- PI ProcessBook 2015
- PI Coresight

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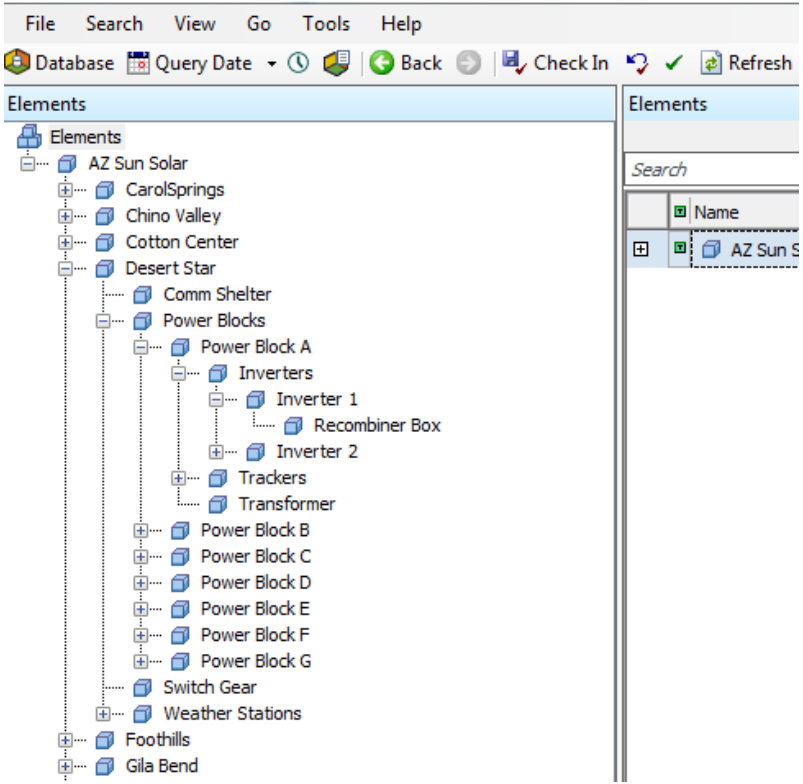
Asset Framework Model for Utility Scale Solar



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Enterprise Agreement OSIsoft

- EA for about 18 months.
- PI System development easier because of licensing and number of tags no longer an issue.
- Meet bi-weekly with OSIsoft Enterprise Program Manager.
- Interact with the Center of Excellence regarding new PI System projects at APS.
- Upgraded multiple PI Servers to latest versions/reference architecture/best practices.

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Residential - Solar Partner Program (SPP)

- APS owned, operated and maintained residential rooftop PV (Photovoltaic) systems with advanced inverters
- $30/month for 20 years
- Total 10MW (approx. 1500 systems)
- Research collaboration with EPRI (Electric Power Research Institute)

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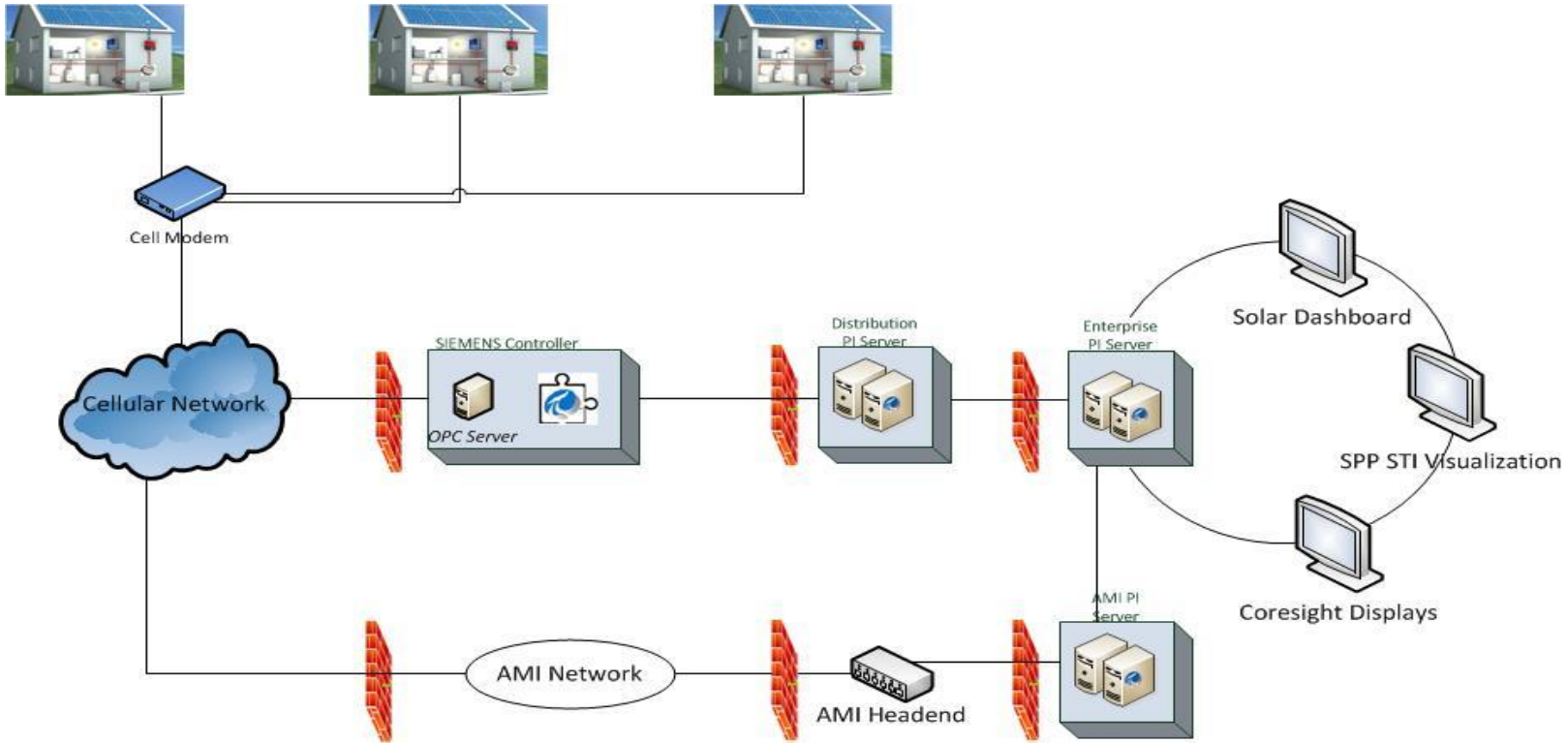
Communication and Control Architecture



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PI System Technology – Solar Partner Program

- SIEMENS SICAM PAS OPC Server (9 servers)
- PI OPC Interface
- PI OPC AutoPointSync
- HA Server on a zoned system (Distribution PI Server)
- PI to PI Interface
- PI to PI AutoPointSync
- HA Server on the APS corporate network (Enterprise PI Server)
- PI ProcessBook 2015
- PI Coresight 2015
- Asset Framework (AF)
- PI UFL (Universal File Loader) Interface

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EPRI – Electric Power Research Institute

- Install Power Quality Monitors on selected Feeders
- Collect 1 second and 1 minute data on feeders
- EPRI sends collected data (CSV files) to APS via FTP.
- APS loads EPRI data into PI Server using PI UFL (Universal File Loader Interface)
- APS sends EPRI the following data
  - PV Inverter data
  - Meter read data (AMI – Automatic Meter Reading)

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Field Measurements collected in PI Server

PQ – 1 second	PQ – 1 minute	Inverters – 5 minute	AMI – Hourly
Voltage	Voltage Flicker	DC Voltage/Current	Energy Consumption
Current	Voltage THD	AC Voltage/Current	
Power	Current THD	Input Power	PV Energy Production
Reactive Power	Sequence Currents	Output Power	
Power Factor	Phase Imbalance	Reactive Power	Avg Voltage
Frequency	Total Energy	Inverter Status	Max Voltage
Fast, Accurate		*Fast, Coarse Data*	*Slow*
Few Locations		*Several Locations*	*Many Locations*

PQ monitors will also capture cycle-level data for transient events

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Power Quality Monitor Installation

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PI System Future Data and Solar

- PI System Future Data – weather data
- 7 Day forecasts – University of Arizona
- Cloud Cover/Wind
- Allows APS to run the generators more efficiently.
- Forecasting allows APS to have economical plants started and ready to go.
- We purchase gas to run plants 1 day ahead so we need forecasts.

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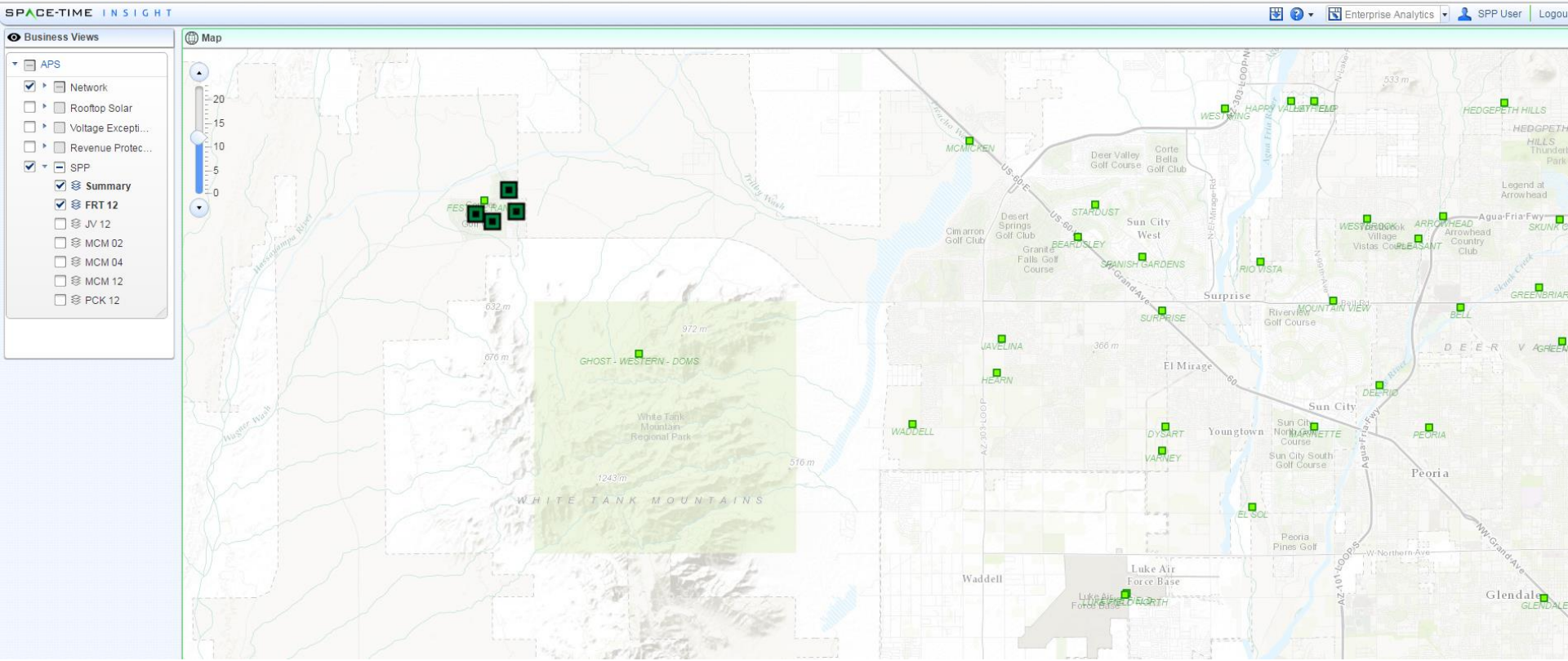
ESRI MAP with Feeders/Inverters



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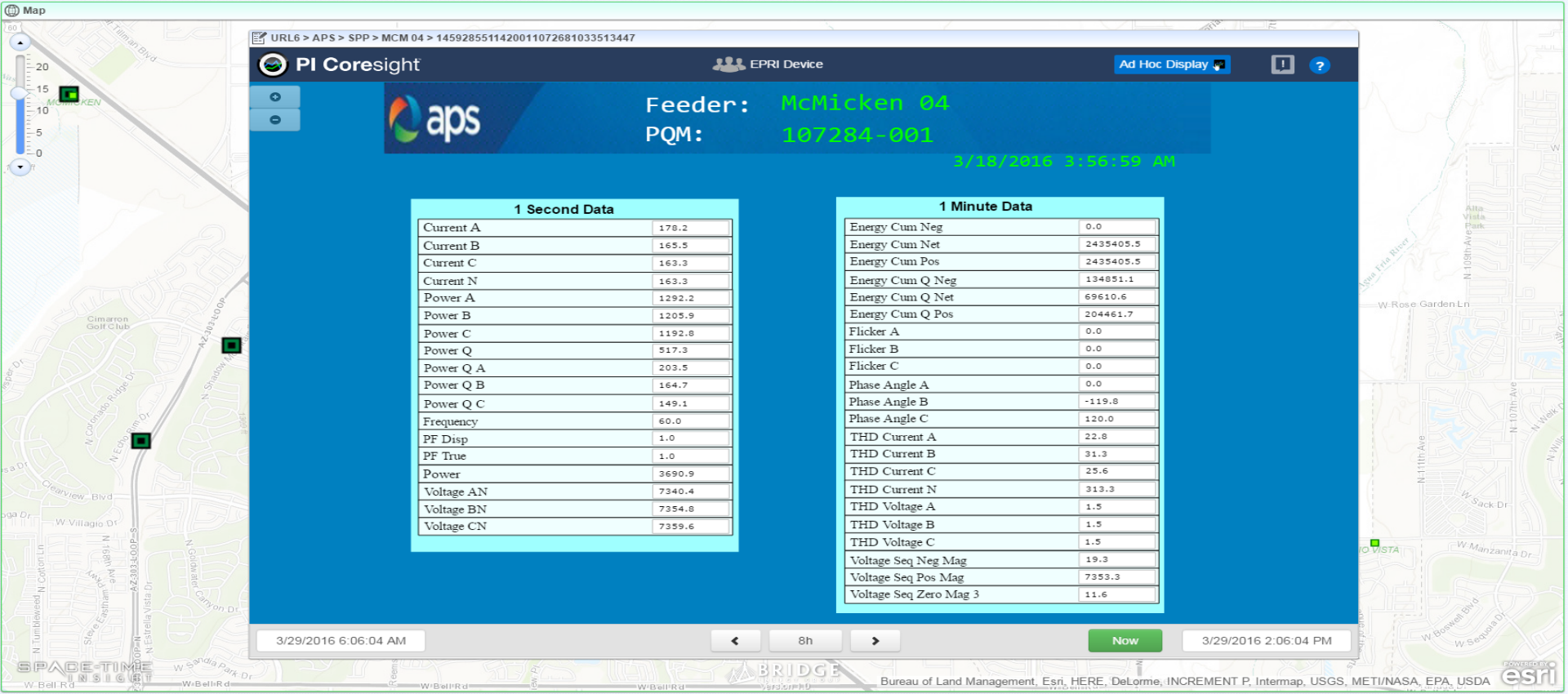
PI Coresight display selected by clicking on ESRI map.



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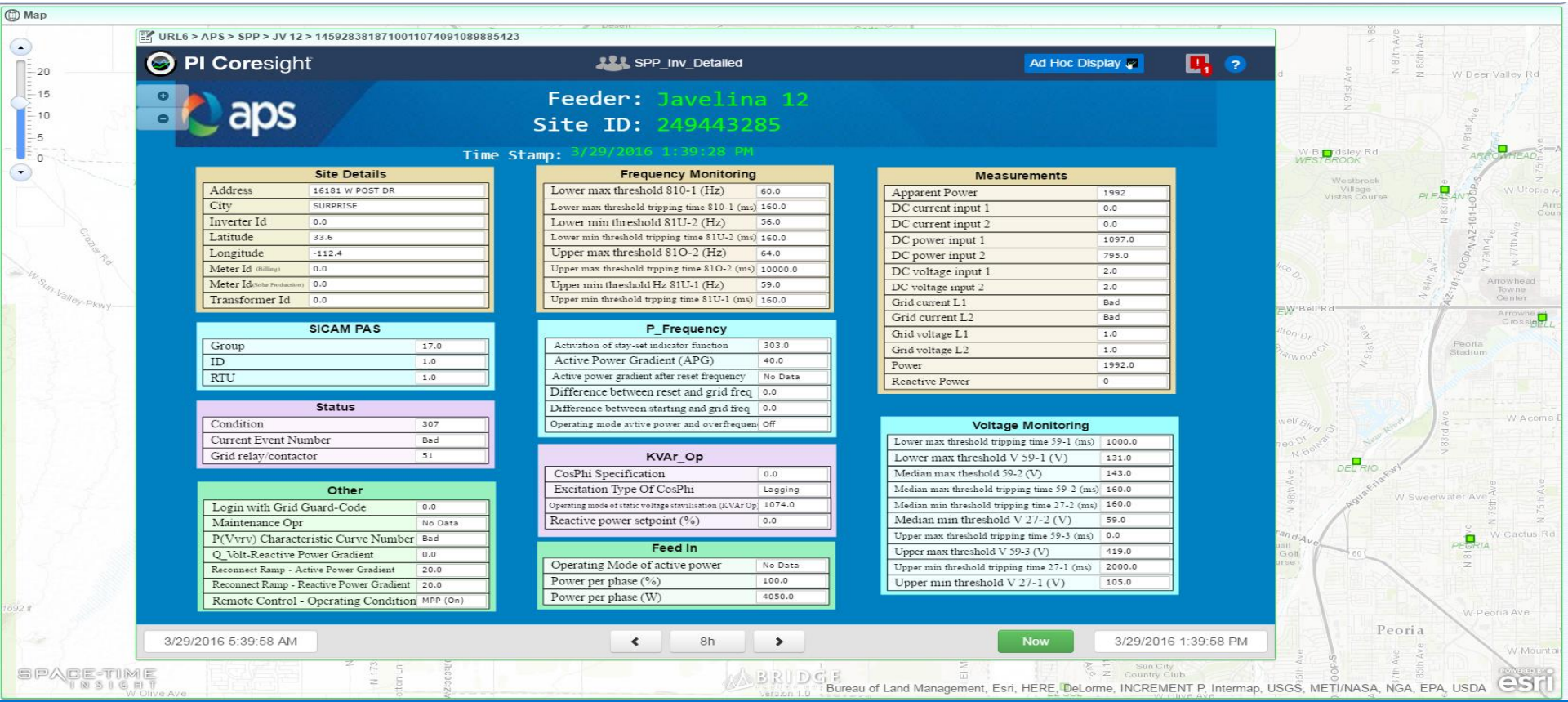
PI Coresight display selected by clicking on ESRI map



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Takeaways

- PI System provides a rich set of tools for visualization, data collection, and analytics.
- OSIsoft PI System is a strategic tool APS has chosen for business decisions.
- Enterprise Agreement – APS has a bi-weekly interaction with OSIsoft through the Enterprise Program Manager and Center of Excellence.

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Contact Information

Kurt Pager

Kurt.Pager@aps.com

PI Administrator

Arizona Public Service

Katie Hoepfl

Kathryn.Hoepfl@aps.com

Solar Engineer

Arizona Public Service

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Questions

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State your **name & company**

Please remember to…

Complete the Online Survey for this session

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谢谢

Danke

Gracias

Merci

Thank You

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Спасибо

Obrigado

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