

Enterprise PI Program

AZ Public Service (APS) uses the PI System
to transform O&M of 10 Utility-scale solar sites

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Today's Talk

- Update on APS and Enterprise PI
- Solar Monitoring Solution Overview
- The Business Perspective
- Summary

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Distributed Energy Resources Operations

APS by the Numbers



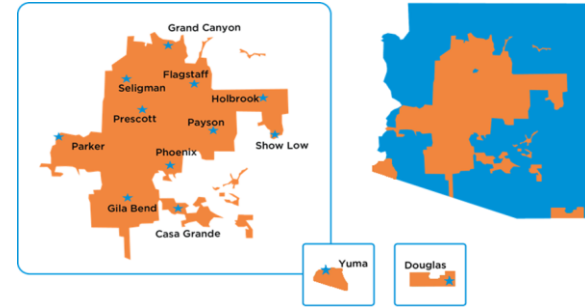
Arizona's **largest** utility
Serving the state since **1886**



Serve **1.2** million homes and businesses
Expect to add **340,000** customers by 2030



2nd largest generation in western US
CAISO Energy Imbalance Market since **2017**
5 new fast ramping units at Ocotillo



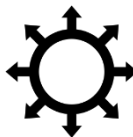
Peak Demand ~ **7,300** MW



1,400 MW solar production (ranked **5th** nationally)
Investing in energy storage (**141** MW in 2020; ~ **660** MW solar + battery by 2025)

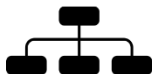
Enterprise PI Program

2017-2018



- Additional solutions (Feeder, Unit Monitoring)
- Additional data sources (AMI, ADMS, ...)
- Enabling users; governance

2016



- Initial solutions
- Additional data sources (SPP, Smart Grid, EMS)
- Unlocking data & enabling users (user groups)

2015



- Enterprise Analytics Strategy / Vision
- Established foundation, data accessible
- EA agreement

2013 - 2014

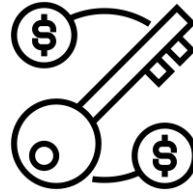


- Generation, EMS data silos
- Lack of analytics framework
- Maintained by PI Support team and local super users

Enterprise PI Program - Looking Forward



Reliable data
in context



Sustainable solutions
that add value



Self service
and adoption

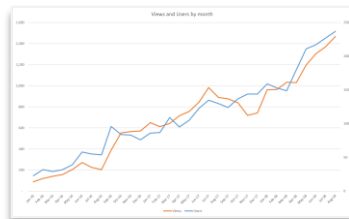


Foundation for
broader analytics



User aligned
roadmap

Delivering Value



User Adoption



Power User Group



Training



T&D User Group



M&T PI Tools



Generation PI Tools



Transmission PI Tools



Distribution PI Tools

DER Solar Monitoring

*Increase production
Reduced time
monitoring, creating
reports & work orders*

Fossil Unit Monitoring

*Heat Rate updates
Unit performance metrics
One version of the truth*

Transmission AF Model

*Improved data access
Load scaling visualization*

Distribution Analytics

*Reduced data gathering
Improved planning
Situational awareness*

Advanced Grid Devices

*100's of 2 way CAP, REG
100's of SCS
1000 Fault Indicators
Increase AGT device avail*

ADMS (Day 2)

Seamless cut over



Trading



Renewables



Generation



Transmission



Distribution



Adv Grid

Transforming Solar Site Operations



Existing PI based system in place



Sites are different



Manual monitoring, work order creation



Lack of clarity on current issues



Reporting is time consuming and limited



Updated solution



Common AF model across sites



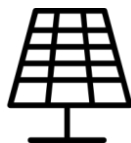
Consistent monitoring; streamlined work orders



Improved visibility & situational awareness

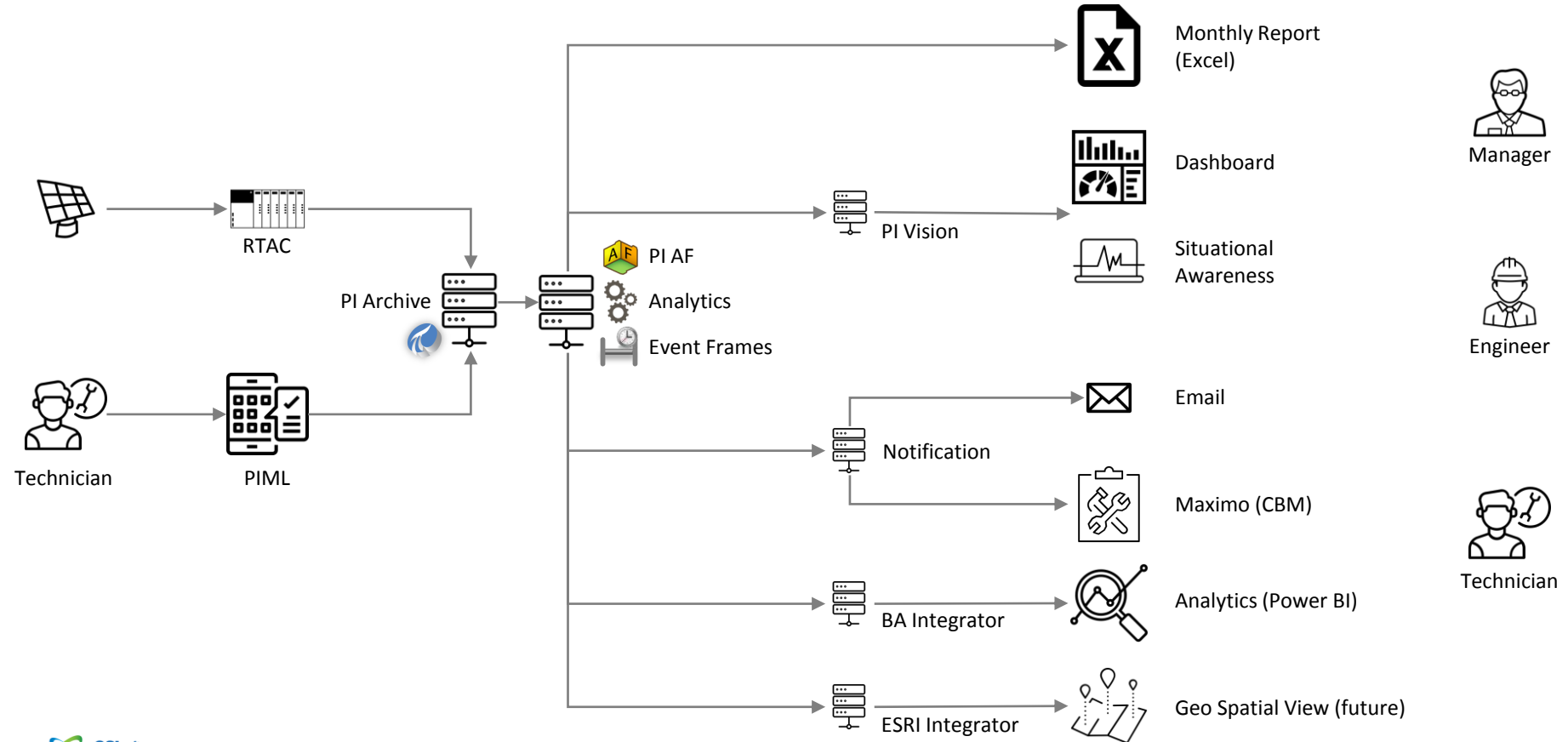


Improved reporting and analytics

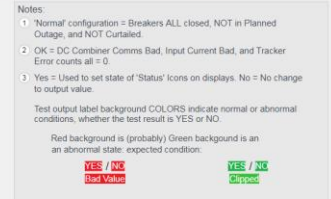


10 sites
210 MW capacity
268 inverters
2,900 trackers

Overall Solution



- Consistent monitoring across sites
- Identify root cause
- Diagnostic views
- Capture significant events
- Enables asset comparison



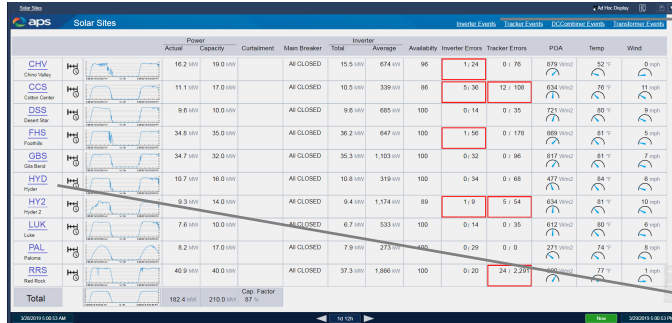
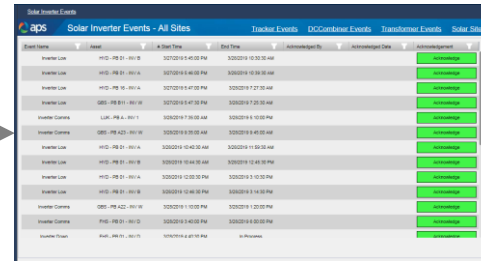
Situational Awareness

View of fleet – production & issues for all 10 sites

View all inverter events

Select site of interest

Select inverter of interest

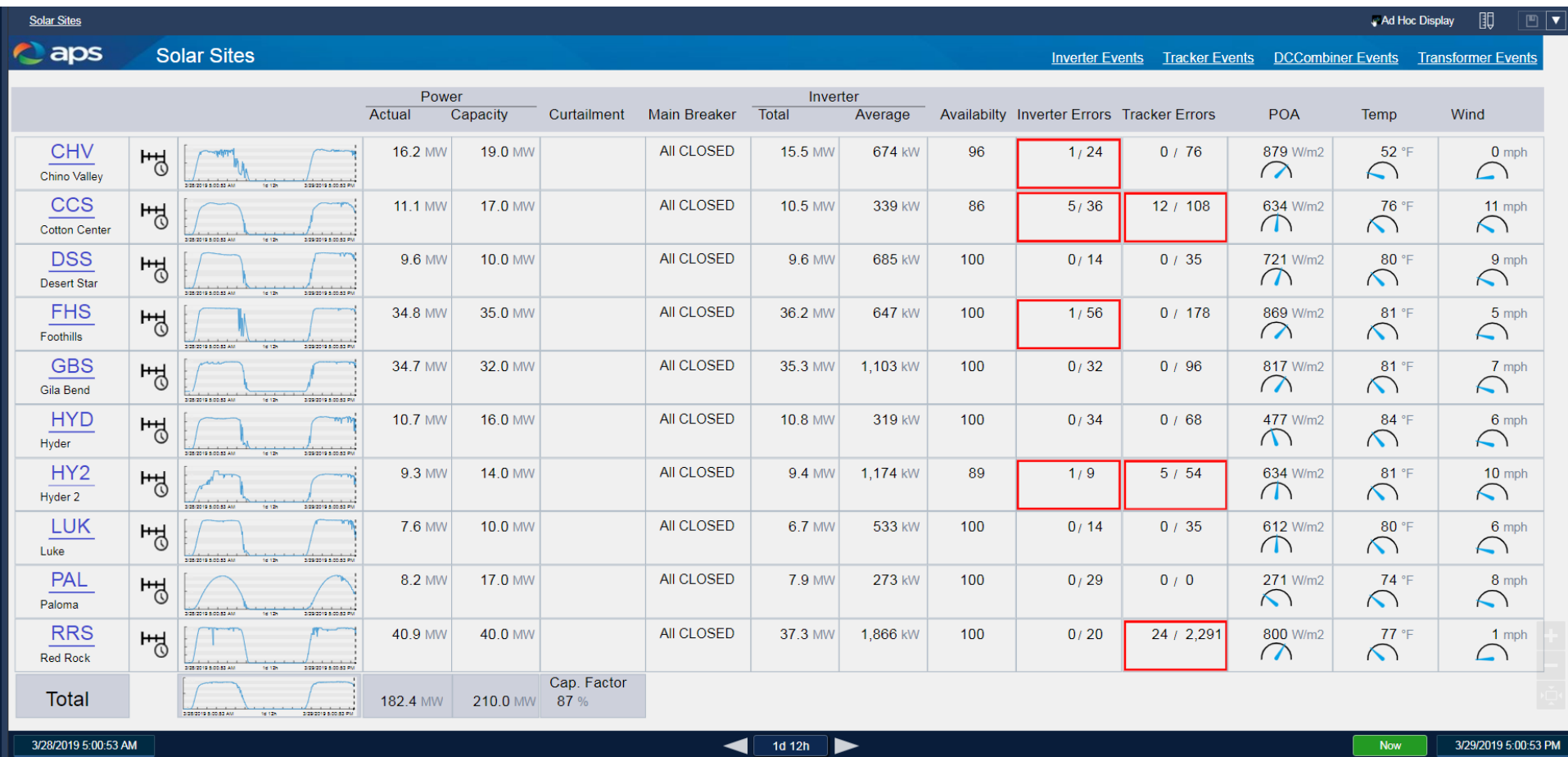


View of production and issues
Inverter performance health



View of inverter and all related trackers & combiners

The Fleet at a Glance



Site Summary

Solar Site Summary - HY2

Asset: Hyder 2

Ad Hoc Display



Solar Site Summary

Hyder 2

Site Events

Solar Sites

Output

Actual 10.6 MW

Capacity 14 MW

Capacity F. 76 %

Curtailment

Breaker All CLOSED

POA 710 W/m2 Temp 81 °F

Inverter Errors 1 / 9

Tracker Errors 5 / 54

DCC Errors 24 / 153

Transformers 0 / 9

Weather Alarms

Comm Shelter A

	A-1	B-1	C-1	D-1	E-1	F-1	G-1	H-1	I-1
KW	1,591.7	1,497.1	1,317.1	Set to Bad	1,218.0	1,355.8	1,020.7	1,378.1	1,236.4
Inverters	●	●	●	●	●	●	●	●	●
Trackers	●	●	●	●	●	●	●	●	●
DCC	●	●	●	●	●	●	●	●	●

[Chino Valley](#)

[Cotton Center](#)

[Desert Star](#)

[Foothills](#)

[Gila Bend](#)

[Hyder](#)

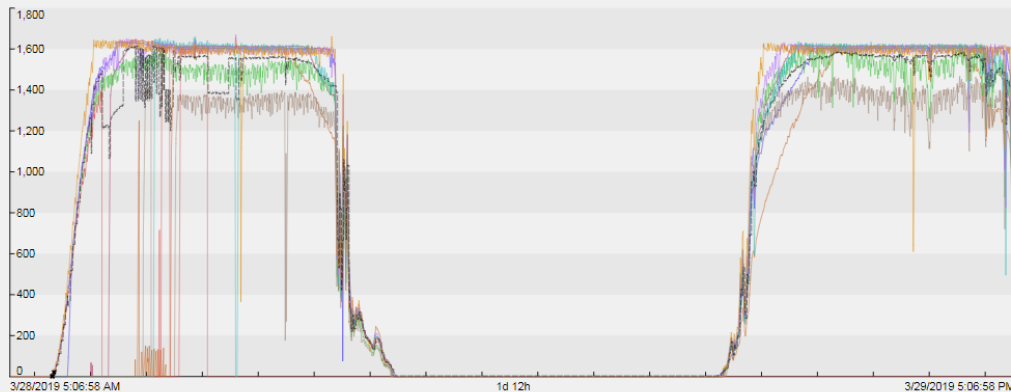
[Hyder2](#)

[Luke](#)

[Paloma](#)

[Red Rock](#)

Output AC Power



Hyder 2|Inverter Power - A
1,326.9 kW
HY2 - PB A - INV 1|Output
1,586 kW
HY2 - PB B - INV 1|Output
1,516 kW
HY2 - PB C - INV 1|Output
1,331 kW
HY2 - PB D - INV 1|Output
0 kW
HY2 - PB E - INV 1|Output
1,203 kW
HY2 - PB F - INV 1|Output
1,331 kW
HY2 - PB G - INV 1|Output
1,038.4 kW
HY2 - PB H - INV 1|Output
1,402.7 kW
HY2 - PB I - INV 1|Output
1,259.5 kW

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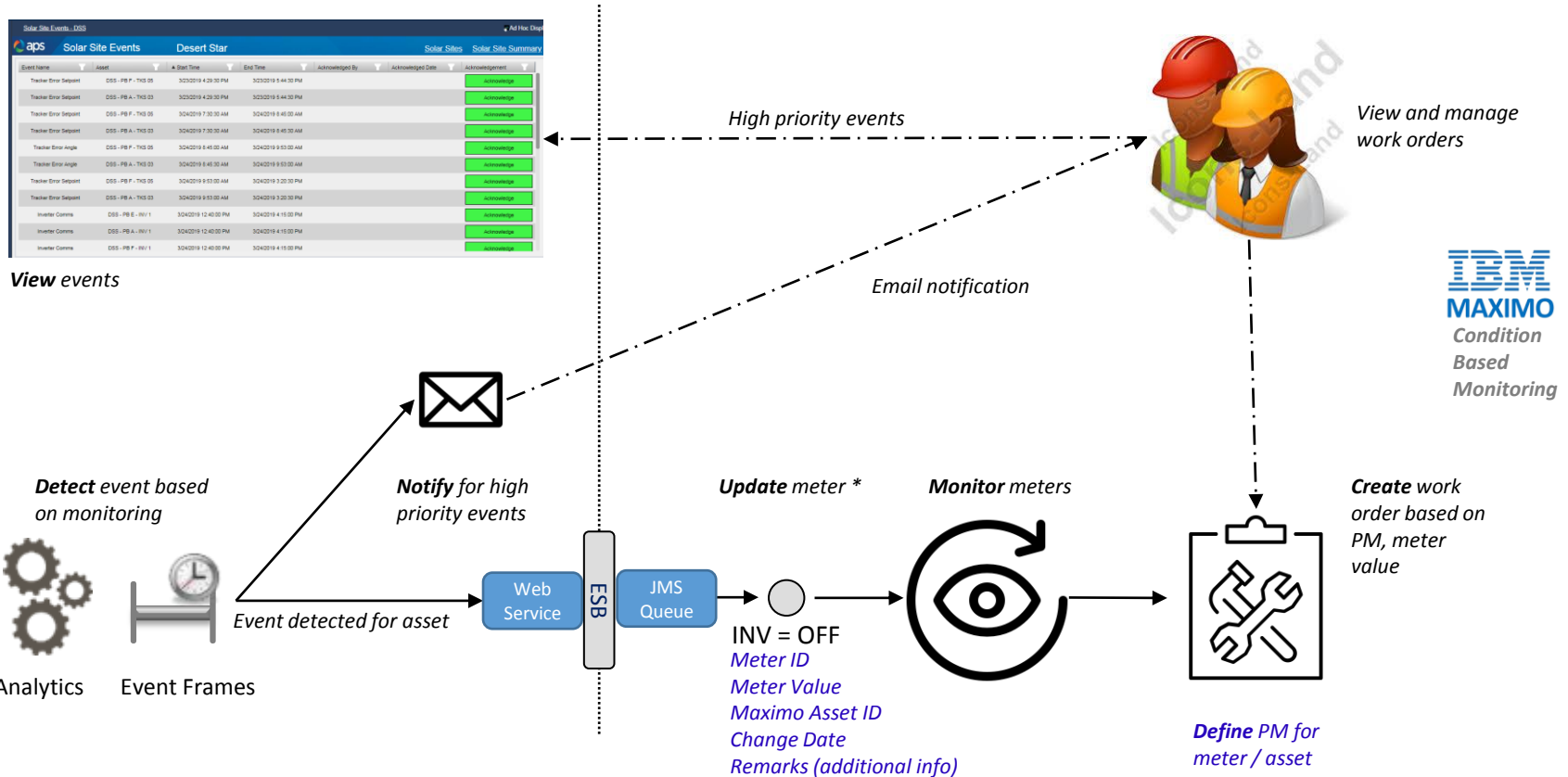
Now

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Diagnosing Inverter Issues



Streamlining Maintenance



Analyzing Solar Events

- View events across sites, over time
- Support slicing and dicing



*A rich source of
new insights*

Using the Solution in Daily Operations

- Challenges
 - Time digging, time creating work orders, time reporting, getting a better picture
- Building the solution
 - Interactive process, done in increments
- Managing the change
 - Impact on the techs – updating data
 - Updating monitoring
 - Updating maintenance process from detection to creating work orders (templates, ...)
 - Updating reporting and analytics
- Using the solution
 - Finding issues, reducing time spent digging, reporting; finding new issues
- More to come
 - Adding storage
 - Additional monitoring

Future of Distributed Energy Resources at APS

- Adding storage at 9 solar sites in 2020
- Planning additional 100 MW of solar and energy storage
- Additional Microgrid installations
- Fundamental change in capabilities of the fleet



The innovative approach to Solar Monitoring at APS is breaking new ground and will be leveraged across the business

Estimated value of over 500 K\$ per year

Creating a sustainable energy future for Arizona



CHALLENGE

Effective monitoring of 10 utility scale solar sites.

- Time consuming to gather data, find issues and create reports.
- Limited situational awareness, lost production.
- Time consuming to create and manage Maximo work orders.

SOLUTION

Implemented Solar Monitoring solution and integrated reporting.

- Consistent monitoring of all 10 sites.
- Situational awareness for the fleet.
- Streamlined creation of work orders.
- Improved reporting and analytics.
- Innovative use of new technologies.

RESULTS

Streamlined maintenance and improved production.

- Reduced time gathering data.
- Clear picture of overall production and issues across the fleet.
- Consistent work orders when needed.
- Improved reporting and analytics.

Questions?

Please wait for
the **microphone**

State your
name & company



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OSISOFT



