

# Role of Resource Data in Solar Asset Management

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SECONDWIND  
by Vaisala



3TIER  
by Vaisala

VAISALA

# Vaisala Is Your Weather Expert!

- We have been helping industries manage the impact of weather for nearly 80 years
- Our weather analysis and consulting services are based on proven science
- We help you understand the true impact of weather on your business, allowing you to improve efficiency and profitability
- Acquired 3TIER Inc. in 2013
  - Globally we have performed solar resource feasibility studies at nearly 800 projects totaling more than 42 GW on all 6 continents
  - We have performed over 5 GW of Solar Energy Due Diligence assessments
  - Our forecasting group is currently providing Wind and Solar Site Specific Forecasting for 18 GW on 4 different continents.



# Different Data For Different Questions

## Past Performance

- Was this an abnormal weather year?
  - Long-term satellite dataset
- How did I perform last month?
  - Onsite measurement station
  - Smaller sites could use satellite data
  - Compare to expected production
- How am I going to perform for the next 17 years?
  - Production data + onsite observations + satellite data

## Future Performance

- What's going to happen in the next 15 minutes?
  - Sky imager or satellite interpolated cloud tracking
- What's going to happen tomorrow or this week?
  - Numerical Weather Prediction modeling + onsite measurements
- What's going to happen next quarter?
  - Climatology based seasonal forecasting

# Reconciling Actual Power Production With Expected Power Production

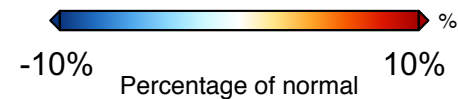
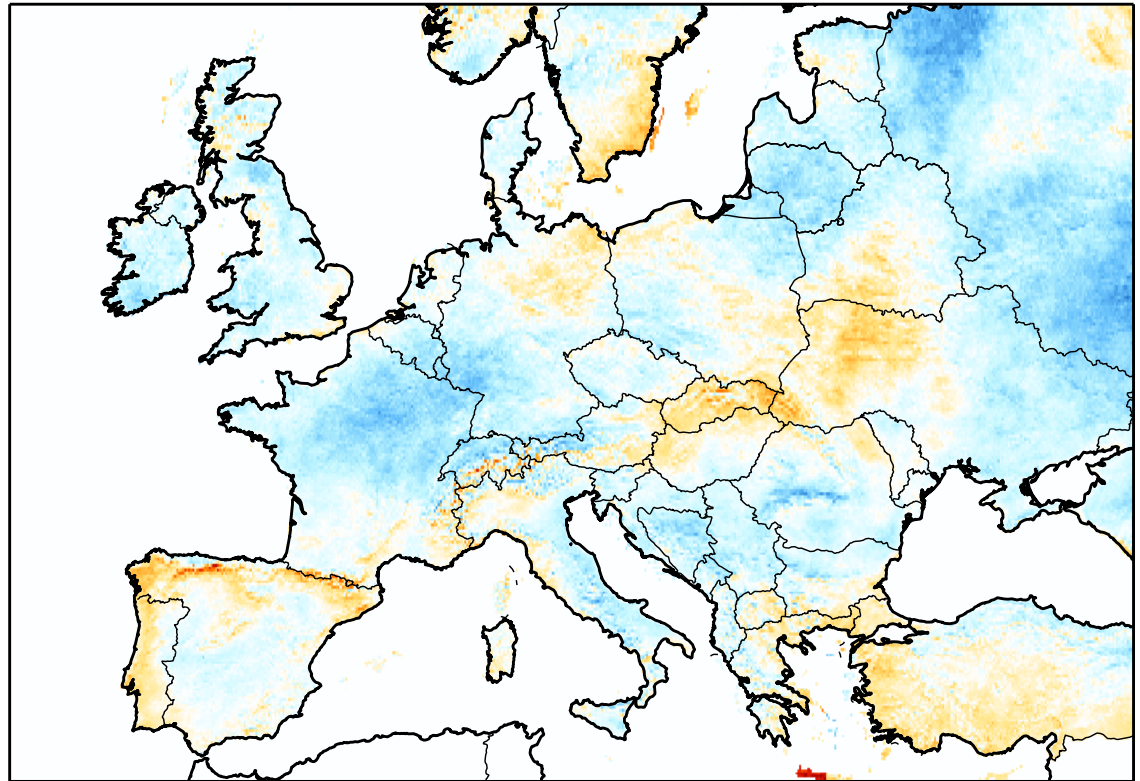
- Was this year an exceptional year or did I choose the wrong location?
- Was it weather or equipment?
- What can I do to make the next day/month/year's production yield better?





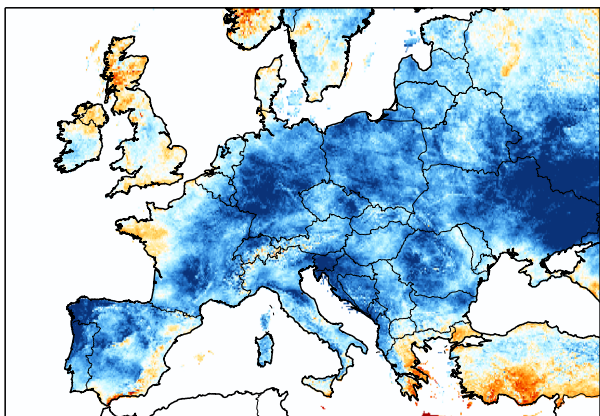
# Solar Resource Variability Effects Performance

2016 Annual Average GHI  
Departure from Normal



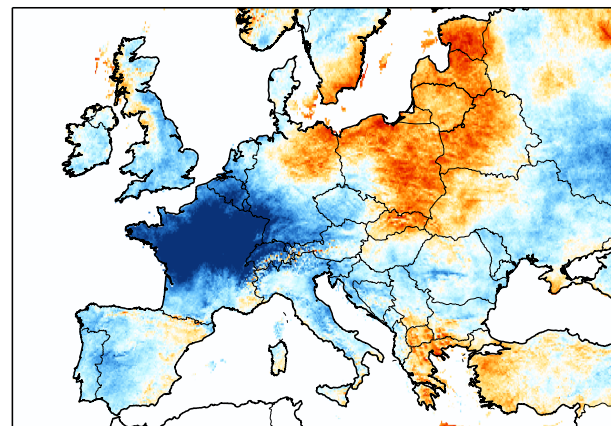
# 2016 Solar Resource Variability

Q1 2016 GHI Anomaly Map



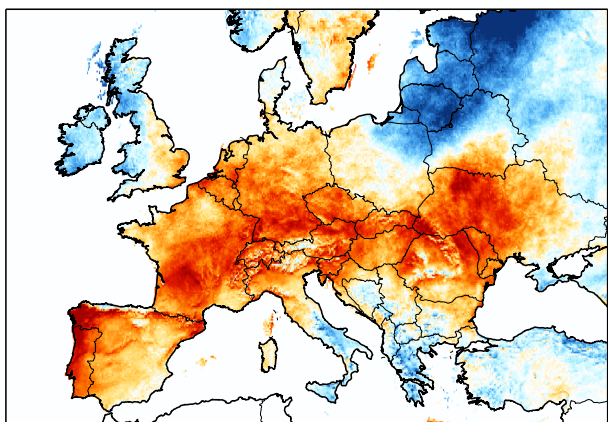
Q1

Q2 2016 GHI Anomaly Map



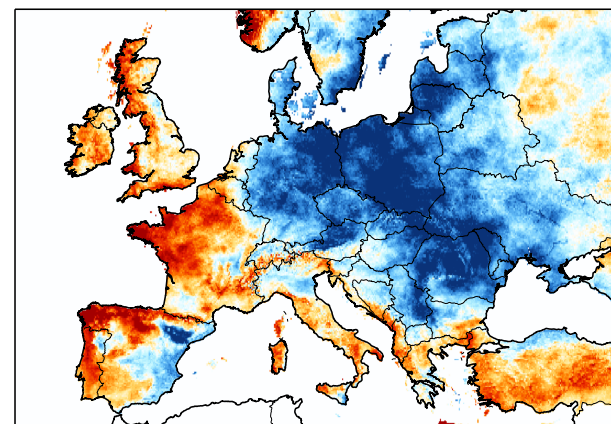
Q2

Q3 2016 GHI Anomaly Map

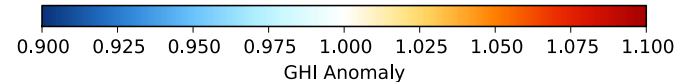
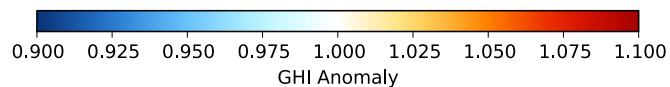


Q3

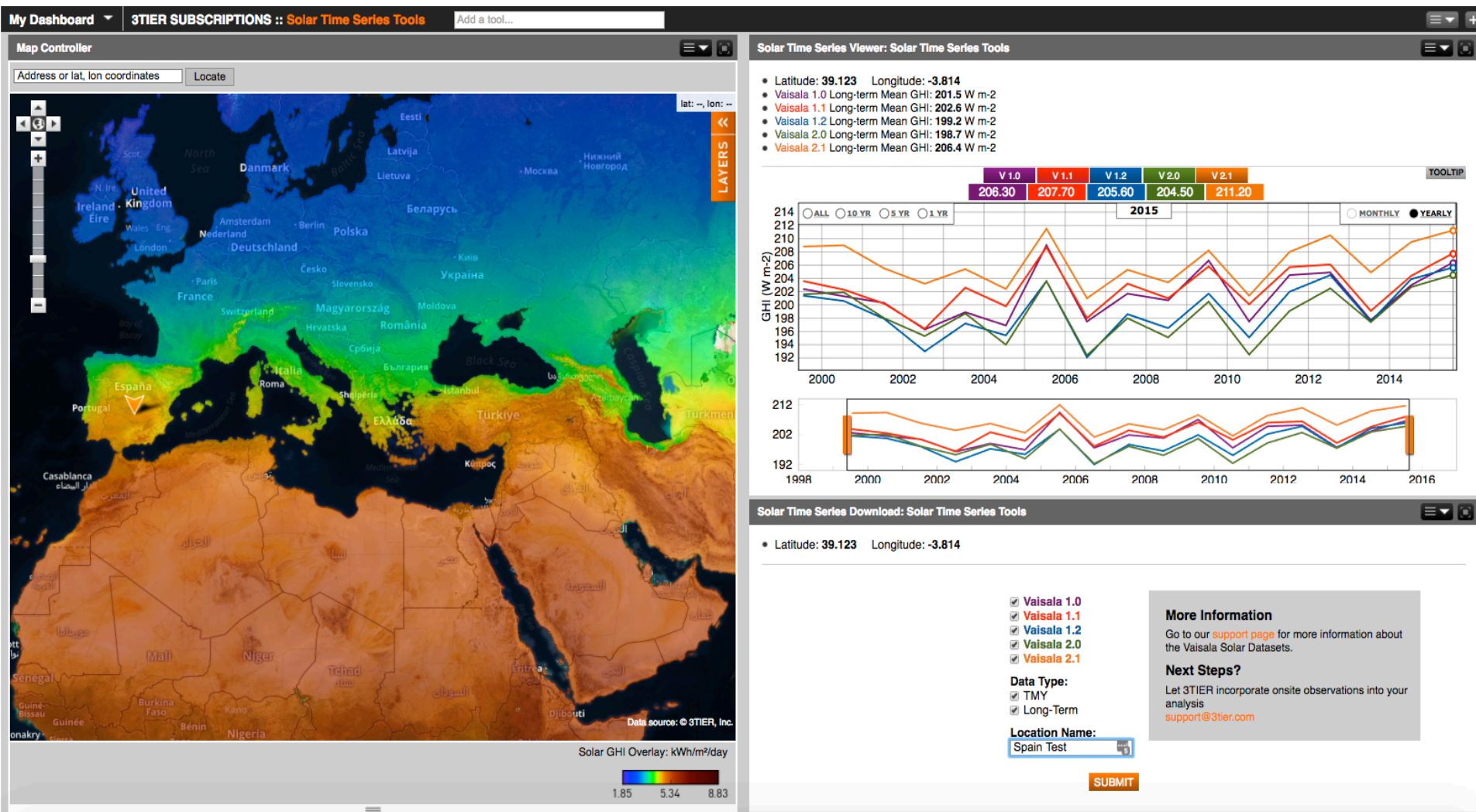
Q4 2016 GHI Anomaly Map



Q4

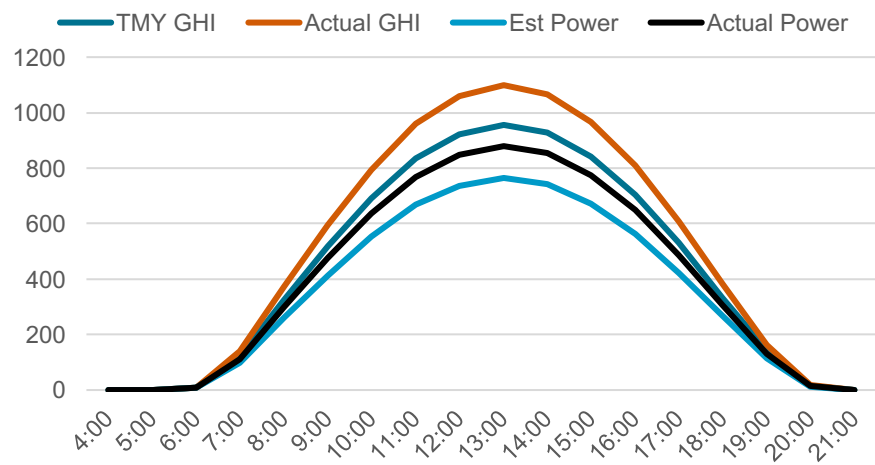
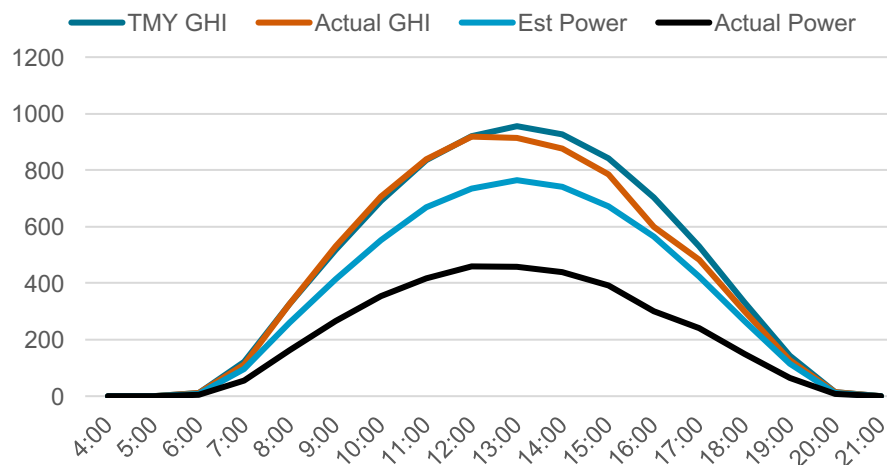
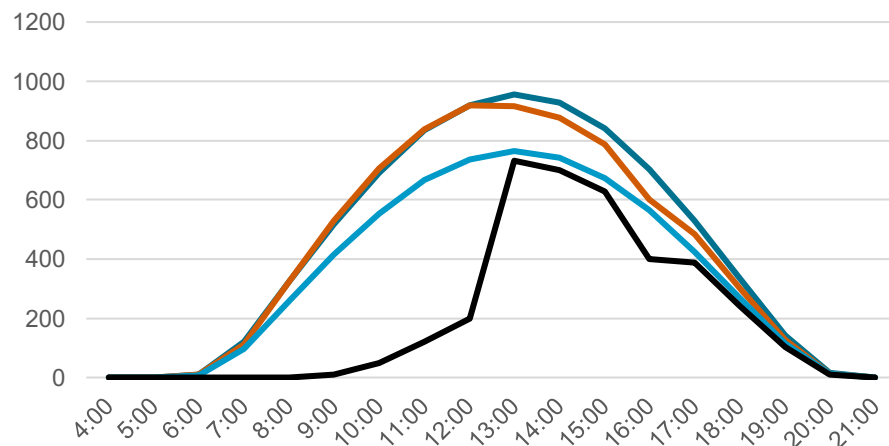
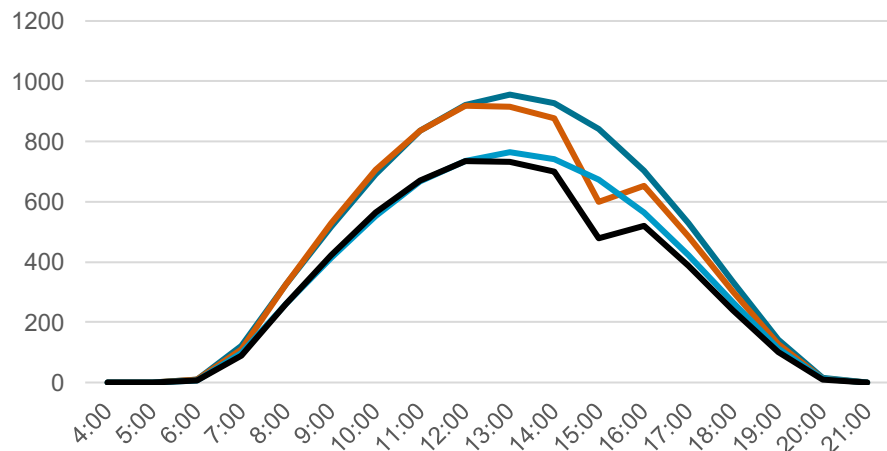


# Monthly Performance Reconciliation





# Daily Performance Reconciliation



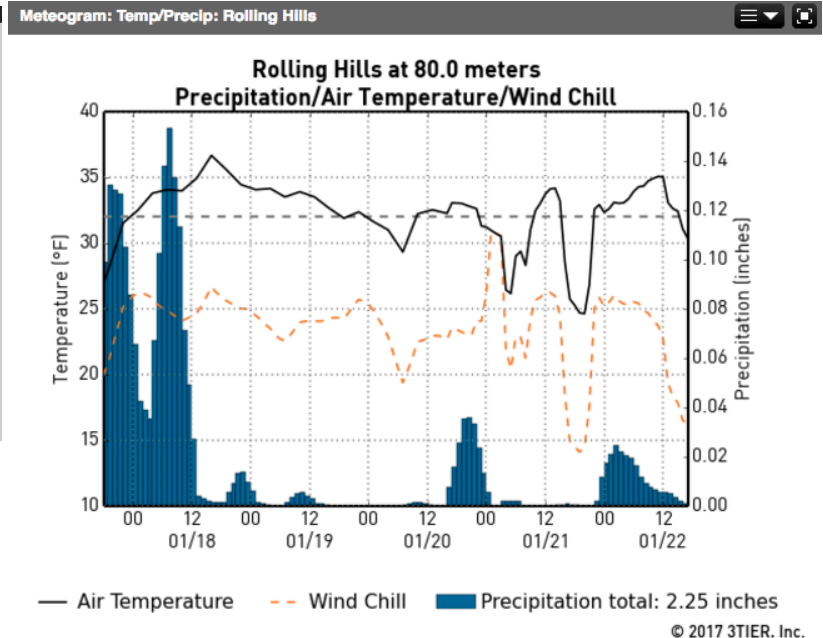


# Forecasting Future Performance

- What good is a forecast for operations management?
- What is going to happen next quarter at my project or portfolio?
- How will I perform for the next 17 years?

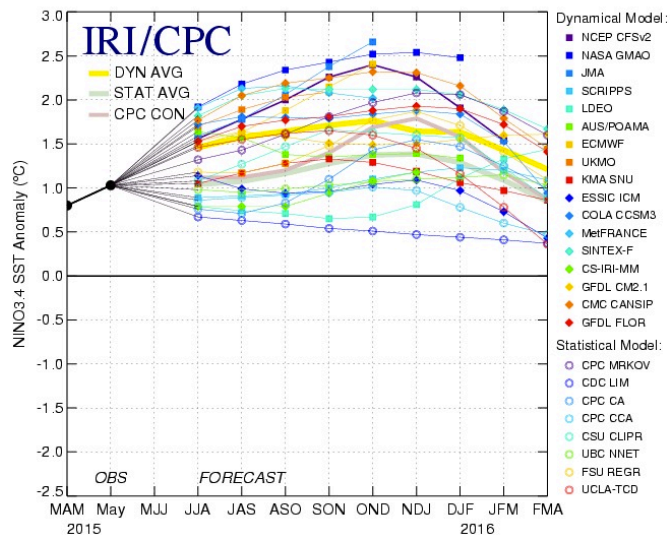


# Day and Week-Ahead Forecasting for Scheduling Maintenance

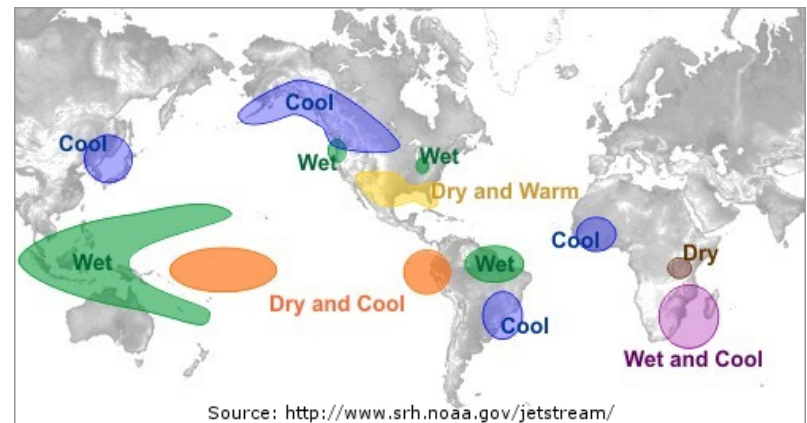
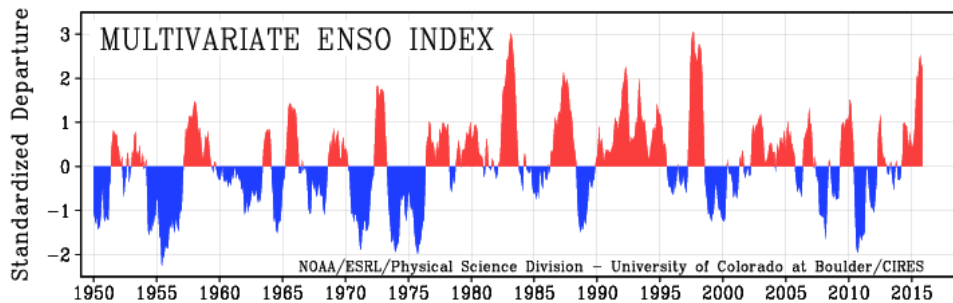
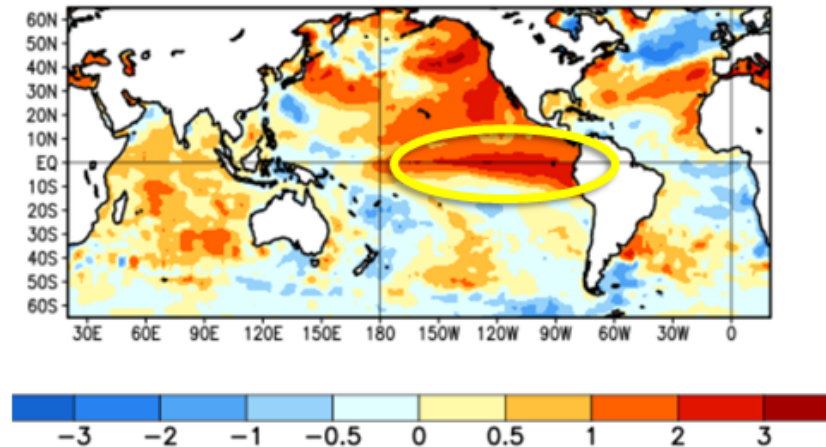


# Long-term Planning with Seasonal Forecasting

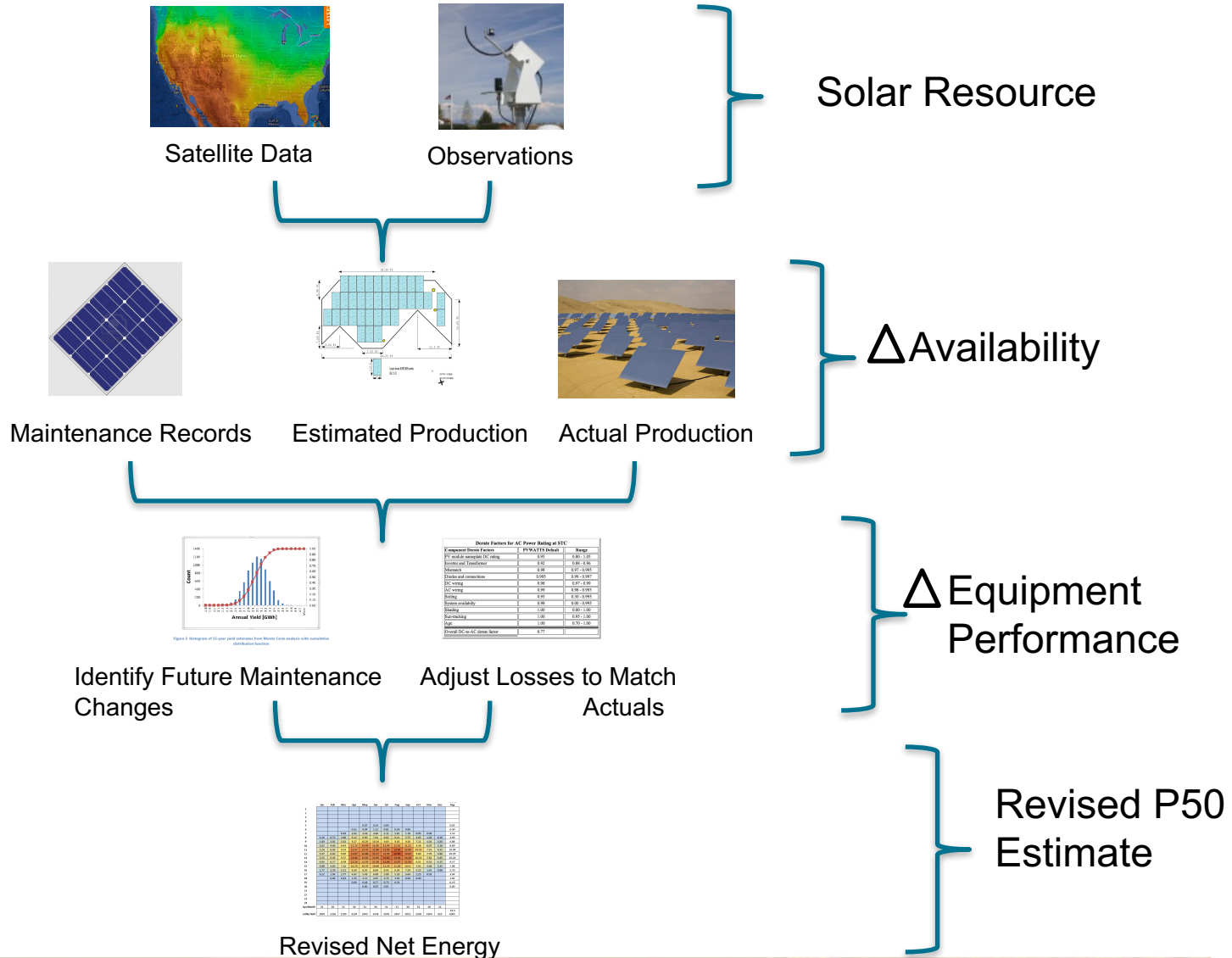
Mid-June 2015 Plume of Model ENSO Predictions



Average SST Anomalies  
19 JUL 2015 – 15 AUG 2015

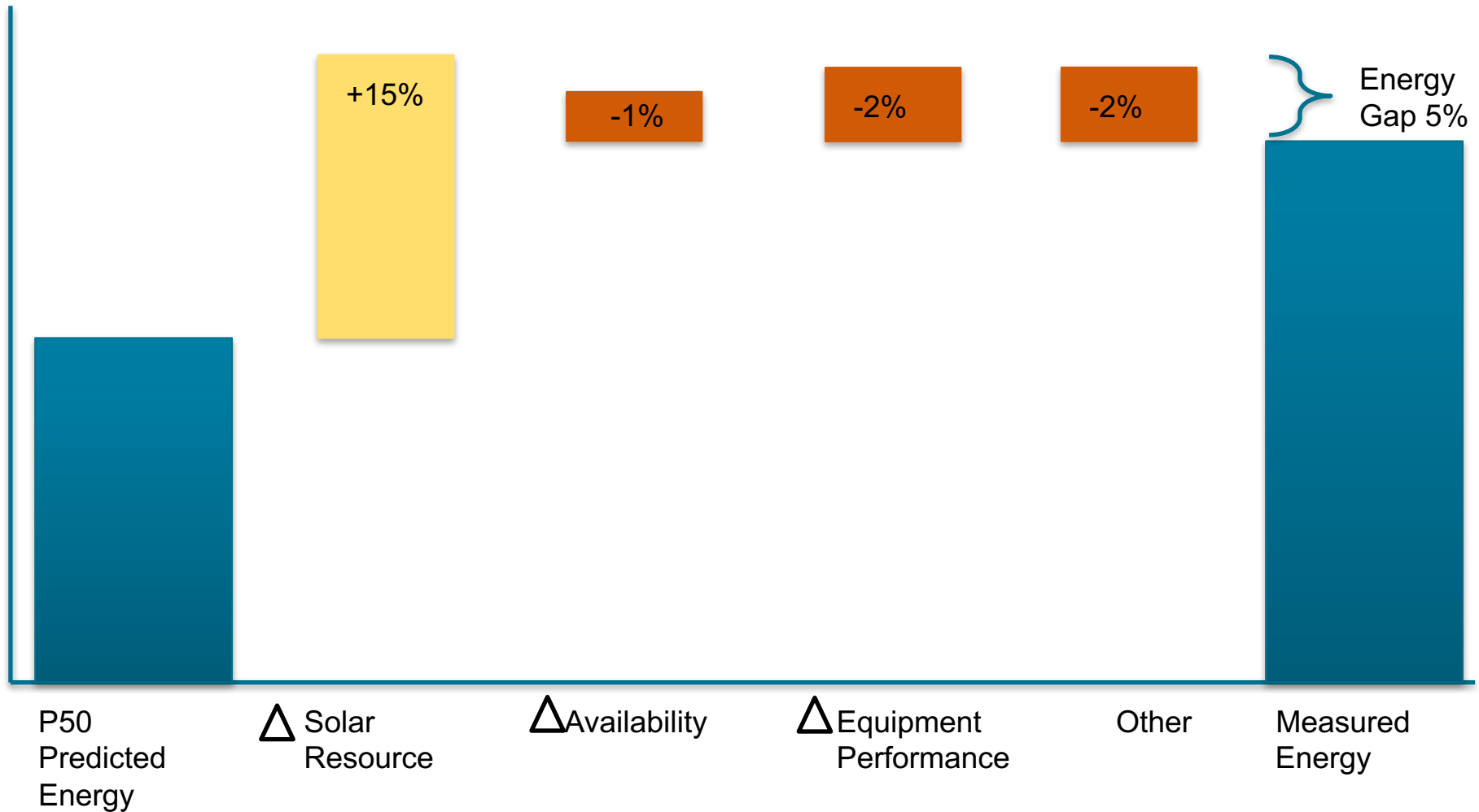


# Forecasting Production For The Remaining Life Of The Plant





# Reforecasting Example From The USA



# Takeaways

Weather data is a key component to understanding project performance...

- Spend less time and money chasing the wrong problem

...and doing proactive maintenance

- Schedule ahead for maintenance during low production windows

It's less expensive than you think to gain this level of insight into your project or portfolio!

**For product information or trial  
access to the online tools  
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**Questions about the content  
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