

# Why digitalization is the right choice for your lifetime asset operation?

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Intersolar 2024– Munich, Germany

# Univers Bazefield

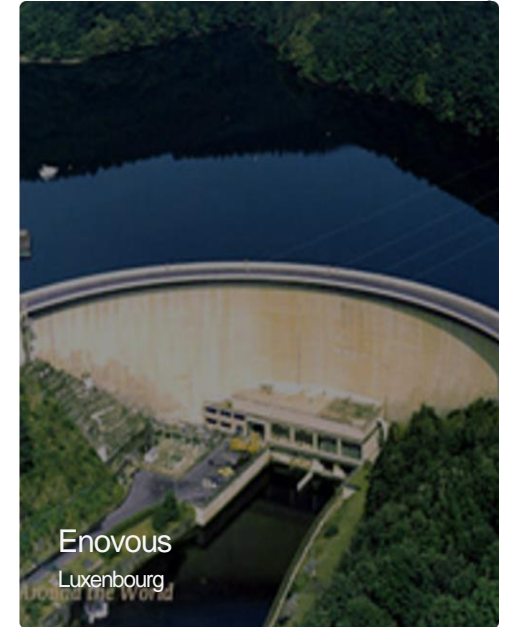
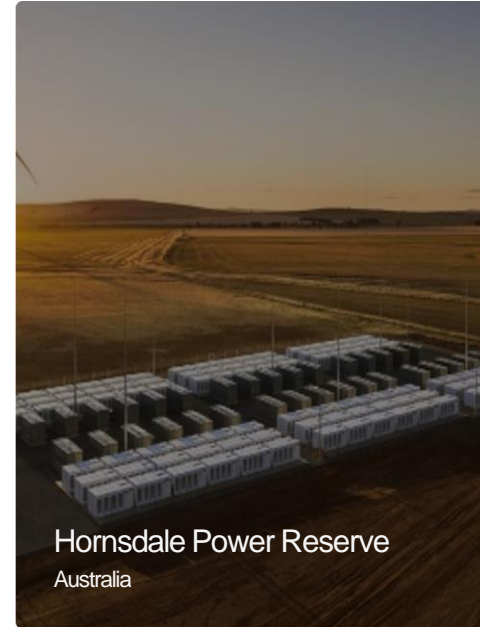
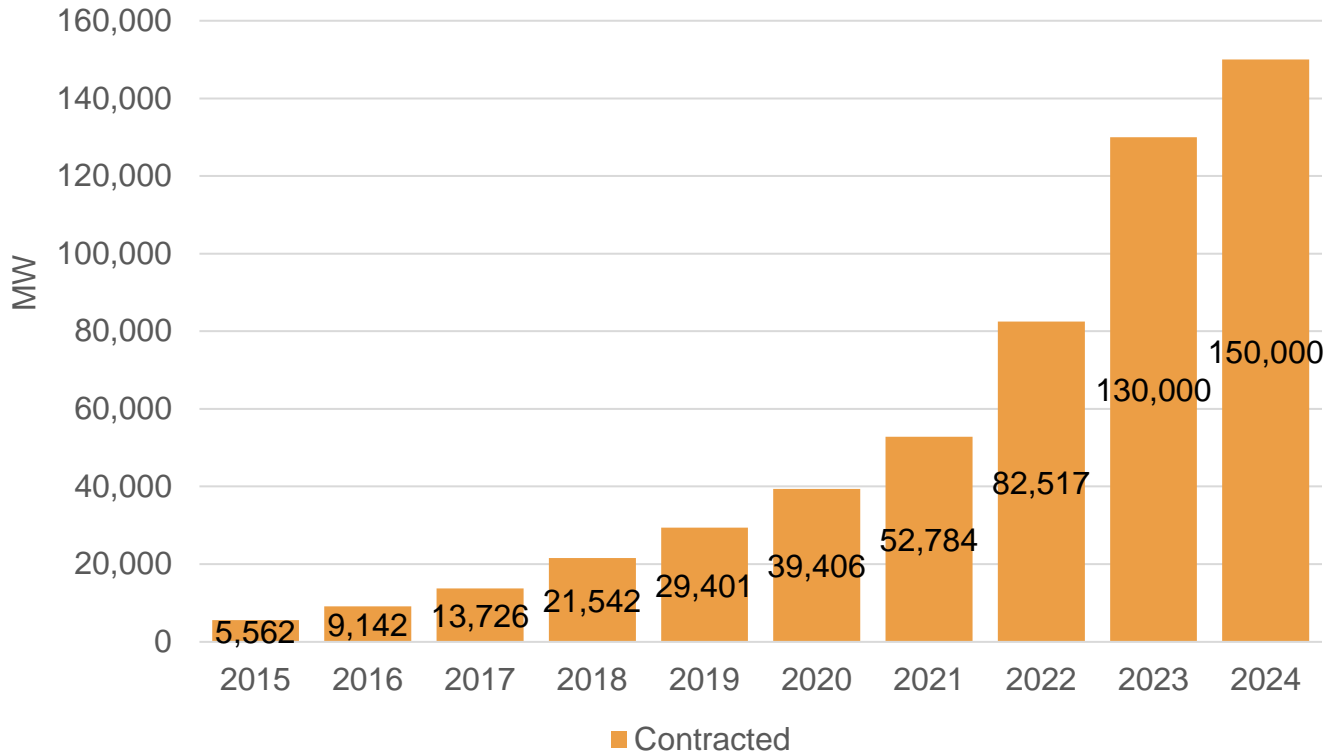
- Global software company within renewables. Roots back to 1991 as an industrial IT company
- OEM independent offering within renewable since 2010
- Offer off-the-shelf support for wind, solar, battery storage, hydro, biomass and other renewable technology sources

## Bazefield: Market-leading Operations Management System

Based on the foundation that has proven scalability, performance, reliability, and robustness over many years across different industries.



# Bazefield manages +150 GW of renewable capacity in 47 countries



# Agenda

- Introduction to Advanced Analytics
- Waterfall Analysis: A revolutionary tool
- Impact of Advanced Analytics on yield
- Wrap up



# Advanced Analytics: The Right Choice for Your Asset Operation

Our offering:

# Bazefield includes AI-driven Advanced Analytics



## Monitoring and control

- Portfolio
- Sites
- Assets
- Control
- Production
- Reports
- Alarms
- Trending



## Analysing

- Availability
- Performance
- Alarms and stops
- Loss
- Power curves
- Weather



## Operations Management

- Work Management
- Events and tasks
- Planning
- Forecast



## Partners/Expert

- Data exchange APIs
- Developers APIs
- Openness
- Data mining and intelligence

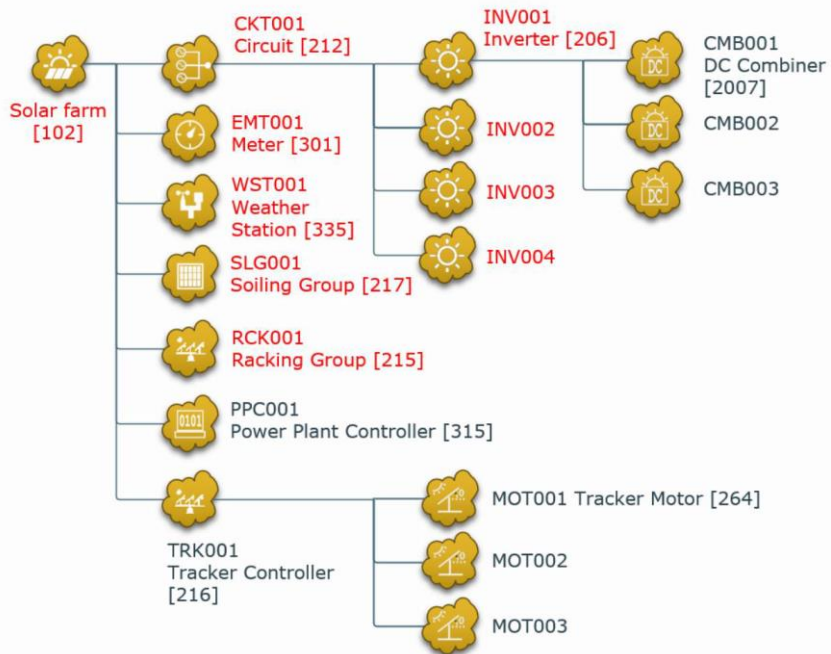
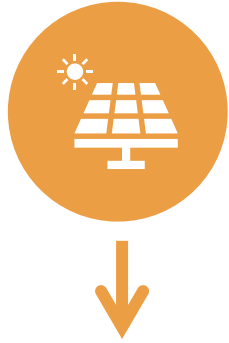


## Advanced Analytics

- Issue detection
- Corrective / Predictive maintenance
- Optimization

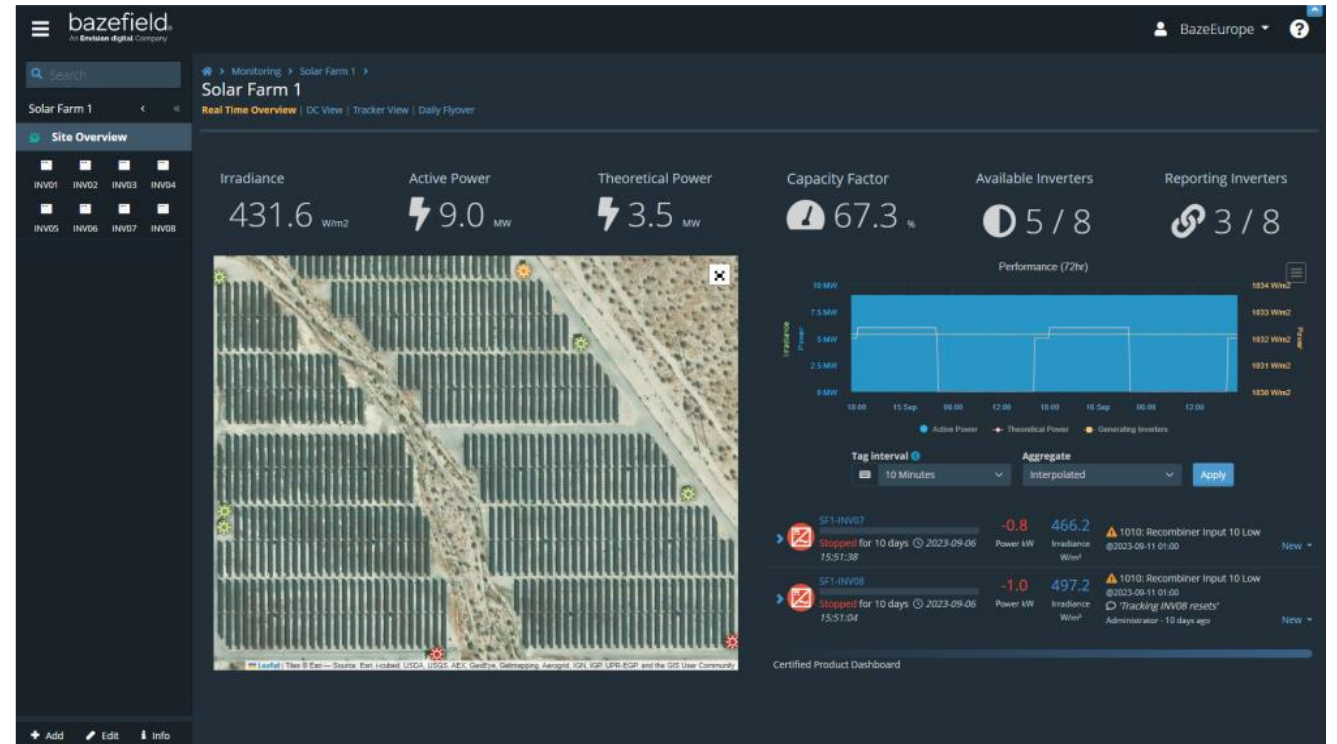
Integrated data management

# Introduction to Advanced Analytics



## Distinctive Features

- Multi technology standard
- Operations Log
- Operations Control
- Availability and Analytics
- Alarm and Allocation Service
- String Monitoring
- Flow and Script Service
- Integrators
- Subscriptions
- ....



# Example of How A Solar Farm is Monitored and Controlled with AA

☰ Bazefield
👤 julian.ascencio.demo
?

🔍 Search

Solar Farm 1 < <<

⚙️ Solar Farm 1

📍 Solar Map

- SF1-INV001 SF1-INV002
- SF1-INV003 SF1-INV004
- SF1-INV005 SF1-INV006
- SF1-INV007 SF1-INV008
- SF1-INV009 SF1-INV010
- SF1-INV011 SF1-INV012
- SF1-INV013 SF1-INV014
- SF1-INV015 SF1-INV016
- SF1-INV017 SF1-INV018
- SF1-INV019 SF1-INV020
- SF1-INV021 SF1-INV022
- SF1-INV023 SF1-INV024
- SF1-INV025

🏠 > Monitoring > Solar Farms > Solar Farm 1 >
📄 Links ⚙️ Edit

## Solar Farm 1

[Site Overview](#) | [Inverters Overview](#) | [Site Production](#) | [Performance](#) | [Weather Stations](#) | [Data Availability](#)

🔌 Active Power

37.9 MW

☀️ Irradiance

462.5 W/m<sup>2</sup>

⚙️ Available

25 / INV<sub>s</sub>

⚡ Running

25 INV<sub>s</sub>

🛑 Stopped

0 INV<sub>s</sub>

🔄 Comms

0 INV<sub>s</sub>

Performance Trend - Last 7 Days

📊 Active Power (MW)   
 — Theoretical Power (MW)   
 — Irradiance   
 — Inverters Available

🌤️ Weather Stations

🔗 Open in Asset Operations

Asset	POA	GHI	Temp. Amb.	Temp. Mod.	Wind Speed	Comms
SF1-WST001	462.5	255.4	13.6	23.6	1.0	

Asset	Irr.	State	AC kW
SF1-INV014	462.47	🟢 Run	1,479 / 3,125
SF1-INV015	462.47	🟢 Run	1,464 / 3,125
SF1-INV016	462.47	🟢 Run	1,456 / 3,125
SF1-INV017	462.47	🟢 Run	1,472 / 3,125
SF1-INV018	462.47	🟢 Run	1,448 / 3,125
SF1-INV019	462.47	🟢 Run	1,603 / 3,125
SF1-INV020	462.47	🟢 Run	1,617 / 3,125
SF1-INV021	462.47	🟢 Run	1,611 / 3,125
SF1-INV022	462.47	🟢 Run	1,590 / 3,125
SF1-INV023	462.47	🟢 Run	1,430 / 3,125
<b>Total</b>	<b>462.47</b>		<b>37,898 / 78,125</b>



# With Advanced Analytics, you get:

**Essential Monitoring & Control** +

**Solar Domain Expertise**

&

**Analytics and Digital Twins**

- Inverters
- Combiner Boxes and Strings
- Trackers
- Weather Stations
- Soiling sensors

## Raw Data



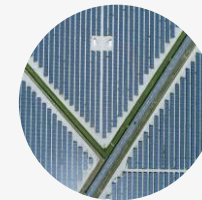
- DAS & SCADA data
- Design & config parameters
- Weather data
- Energy meters
- Inverter data
- Combiner box data
- OEM Alarms

## Intelligent Analysis



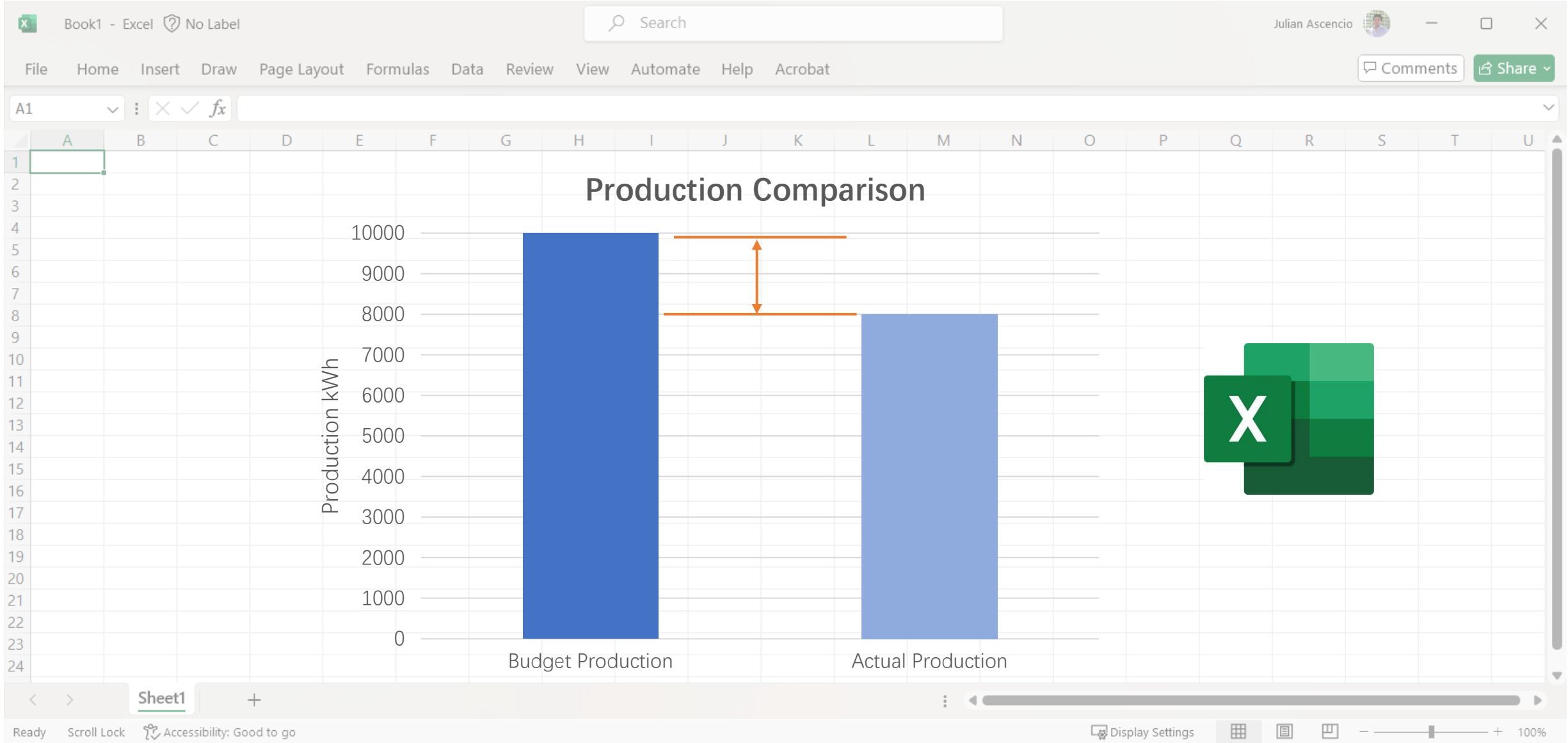
- Data quality checks
- Advanced big data analytics
- Comprehensive KPIs
- Loss breakdown
- Expected power
- Sensor checks
- Downtime event analysis

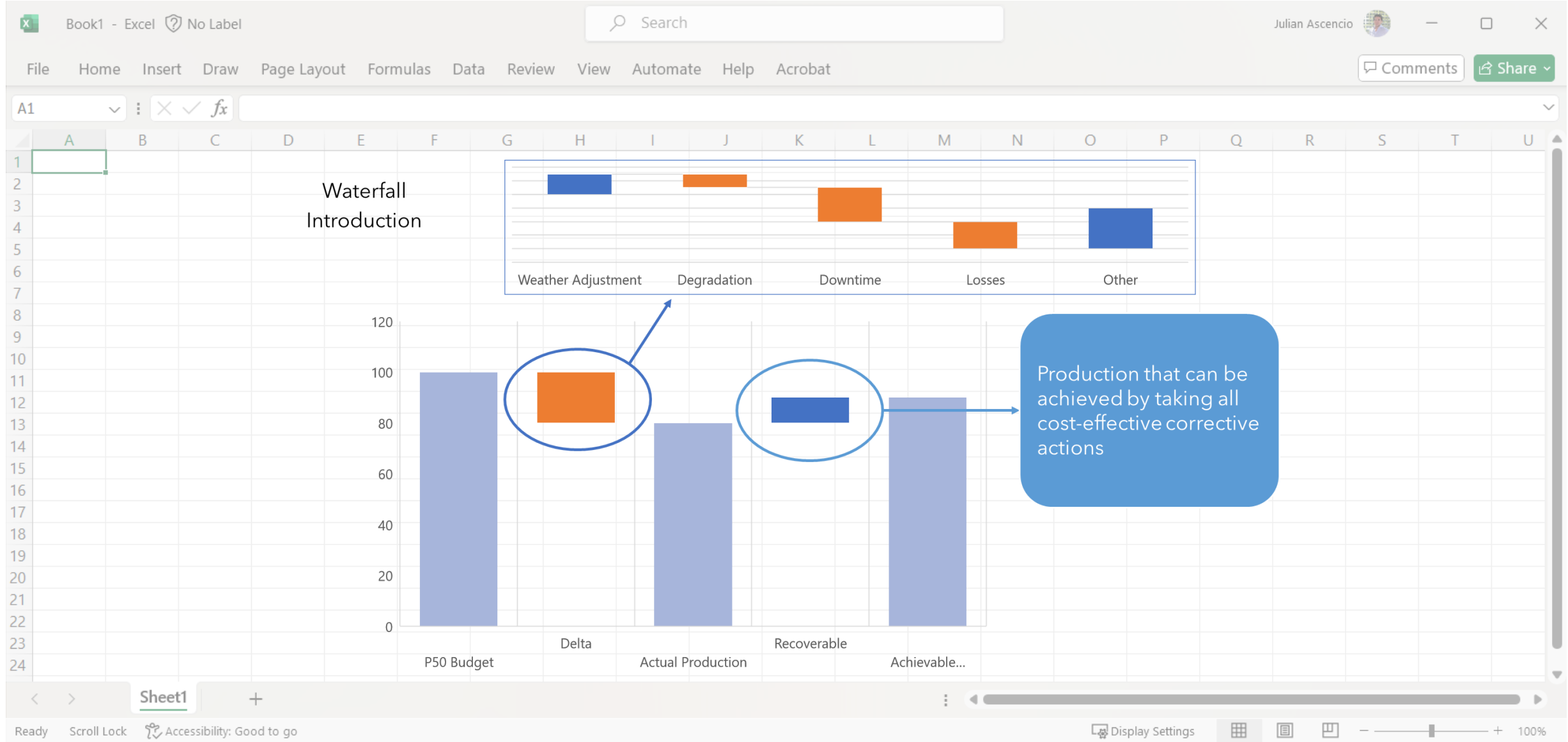
## Corrective Actions



- Increase generation
- Risk management
- Predictive maintenance
- Timely diagnosis
- High O&M efficiency
- O&M contract compliance

Let's dive into Waterfall Analysis





# Reports for Solar: Budget vs Actual



## Why

- Compare Actual vs Budgeted Production
- Understand the production difference
- Potentials to improve performance



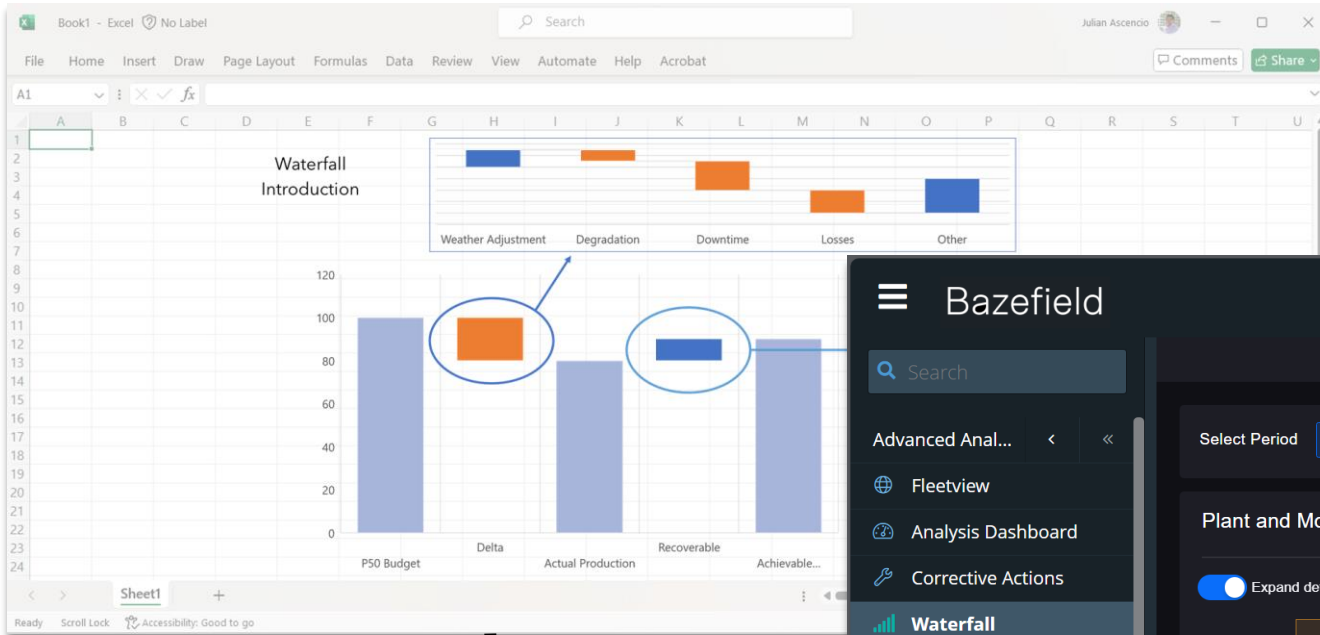
## Who

- Asset Managers
- Financial Analyst
- Performance Engineers



## Key Components

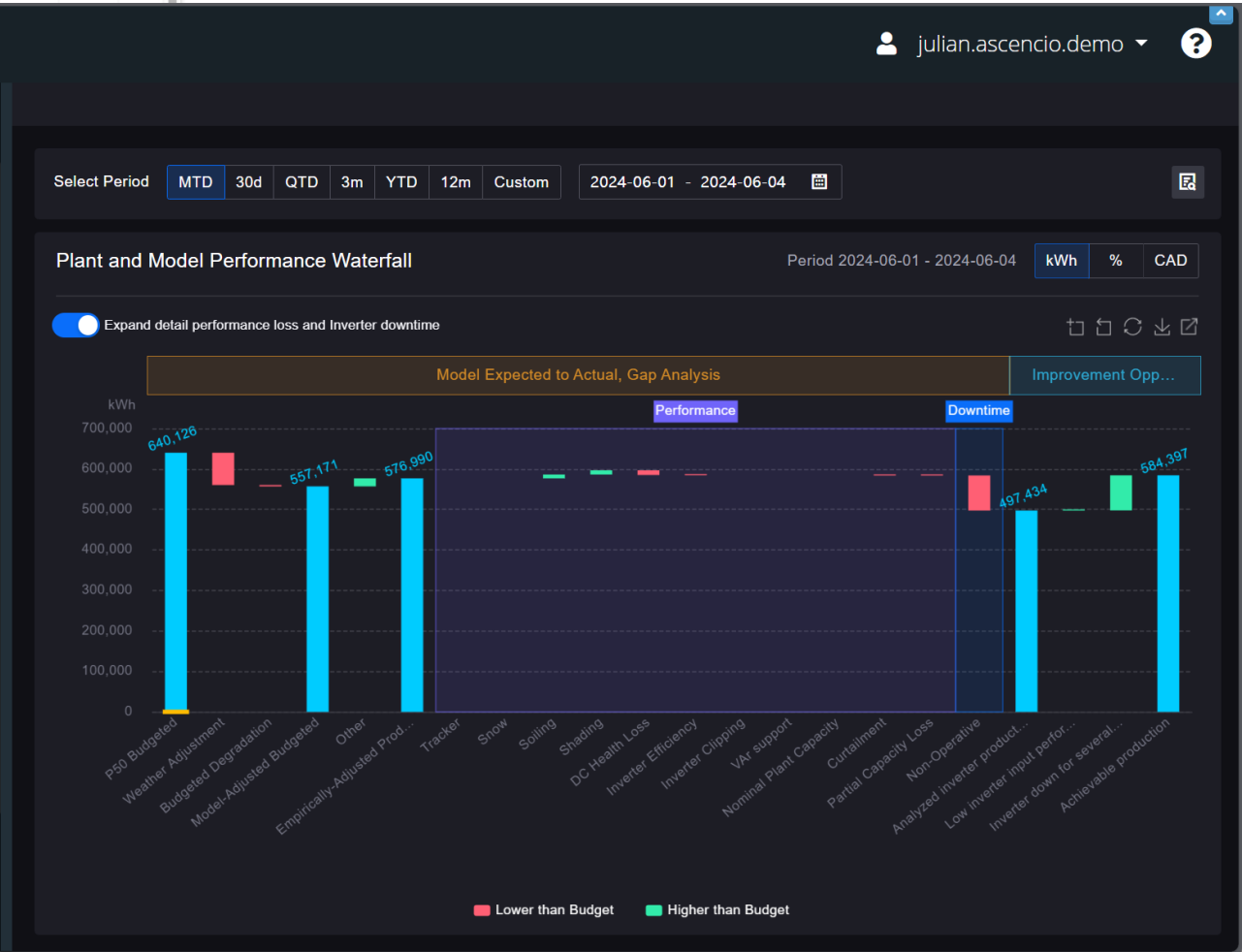
- Weather Adjustment
- Degradation
- Loss Categories



**Bazefield**

Search

- Advanced Anal...
- Fleetview
- Analysis Dashboard
- Corrective Actions
- Waterfall**
- Loss Breakdown
- Inverter Efficiency
- DC Health
- Degradation
- Soiling
- Shading
- Bifacial
- Metrics
- Wash Optimization
- Daily Graphs
- Data Quality
- Sensor Health
- + Add Edit Info



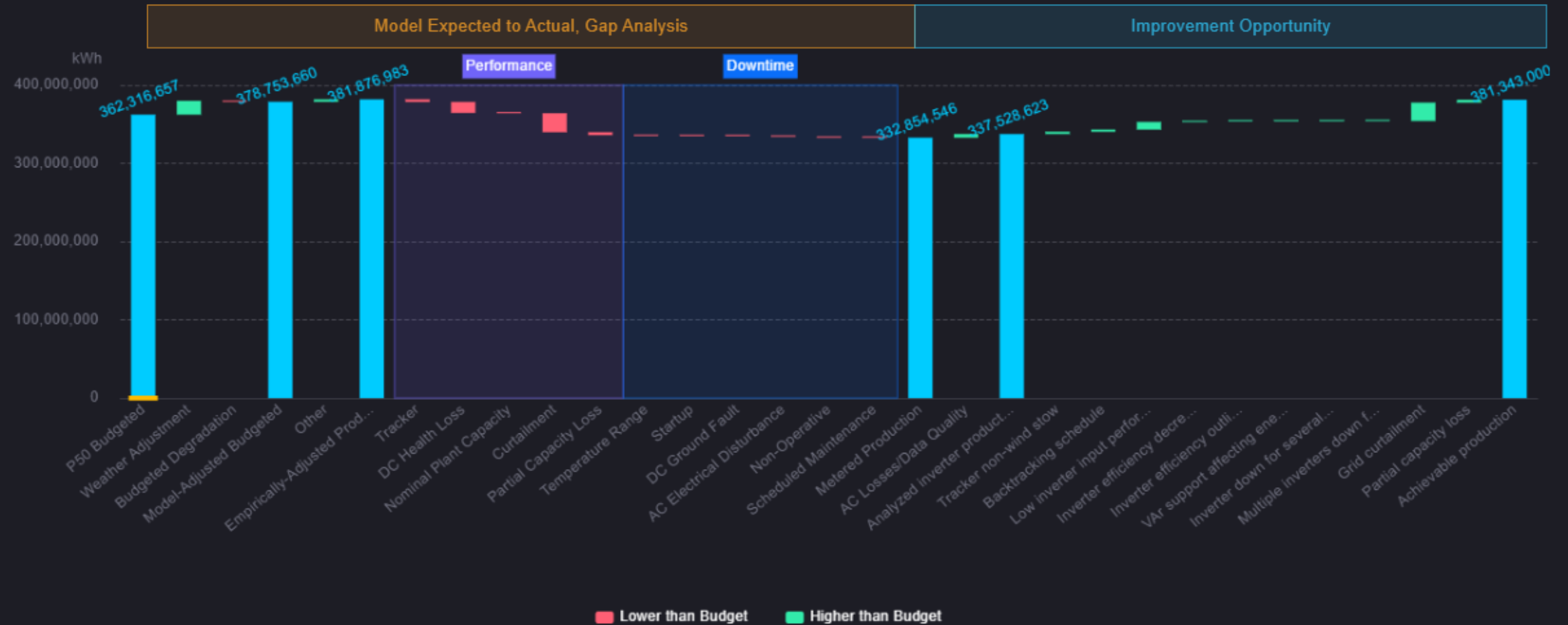
Automate Reporting

# Plant and Model Performance Waterfall

Period 2019-06-17 - 2020-06-15

**kWh** % \$

Expand detail performance loss and Inverter downtime



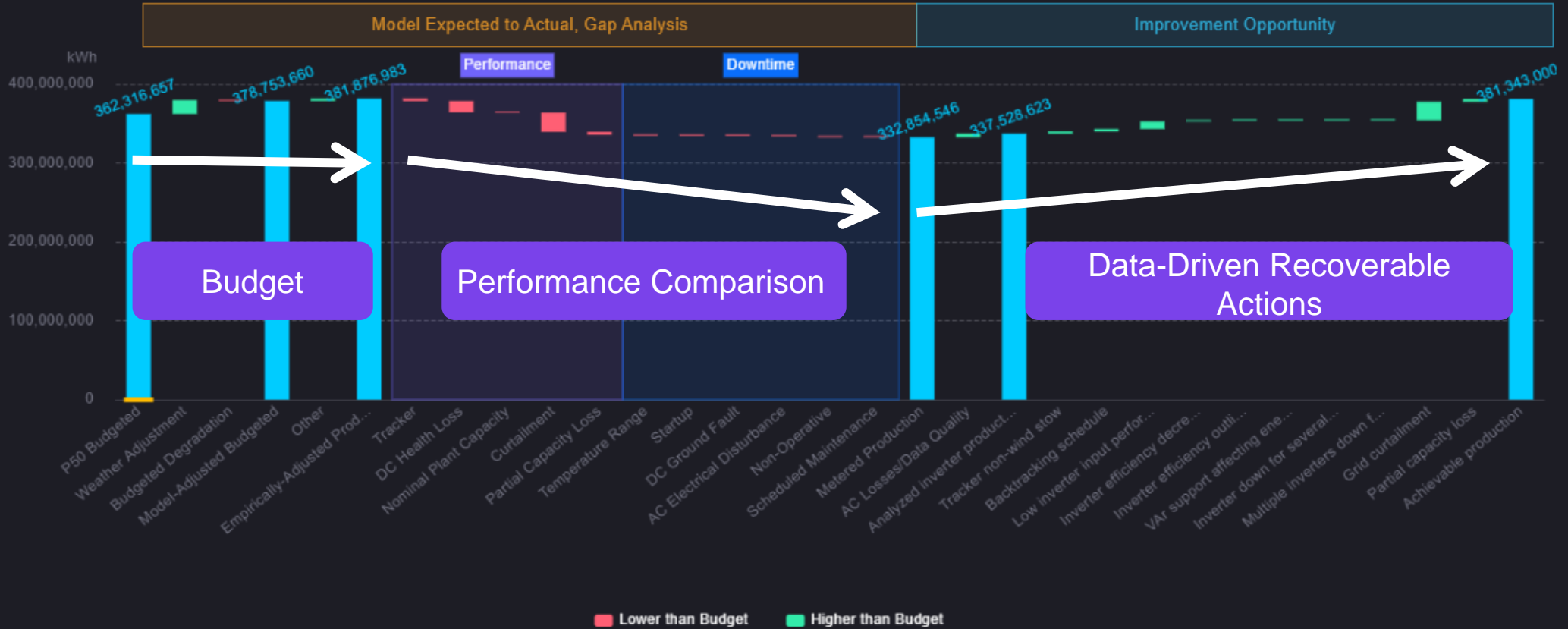
Panela

Select Period MTD 30d QTD 3m YTD 12m Custom 2019-06-17 - 2020-06-15

### Plant and Model Performance Waterfall

Period 2019-06-17 - 2020-06-15 kWh % \$

Expand detail performance loss and Inverter downtime



Waterfall Chart

Budget

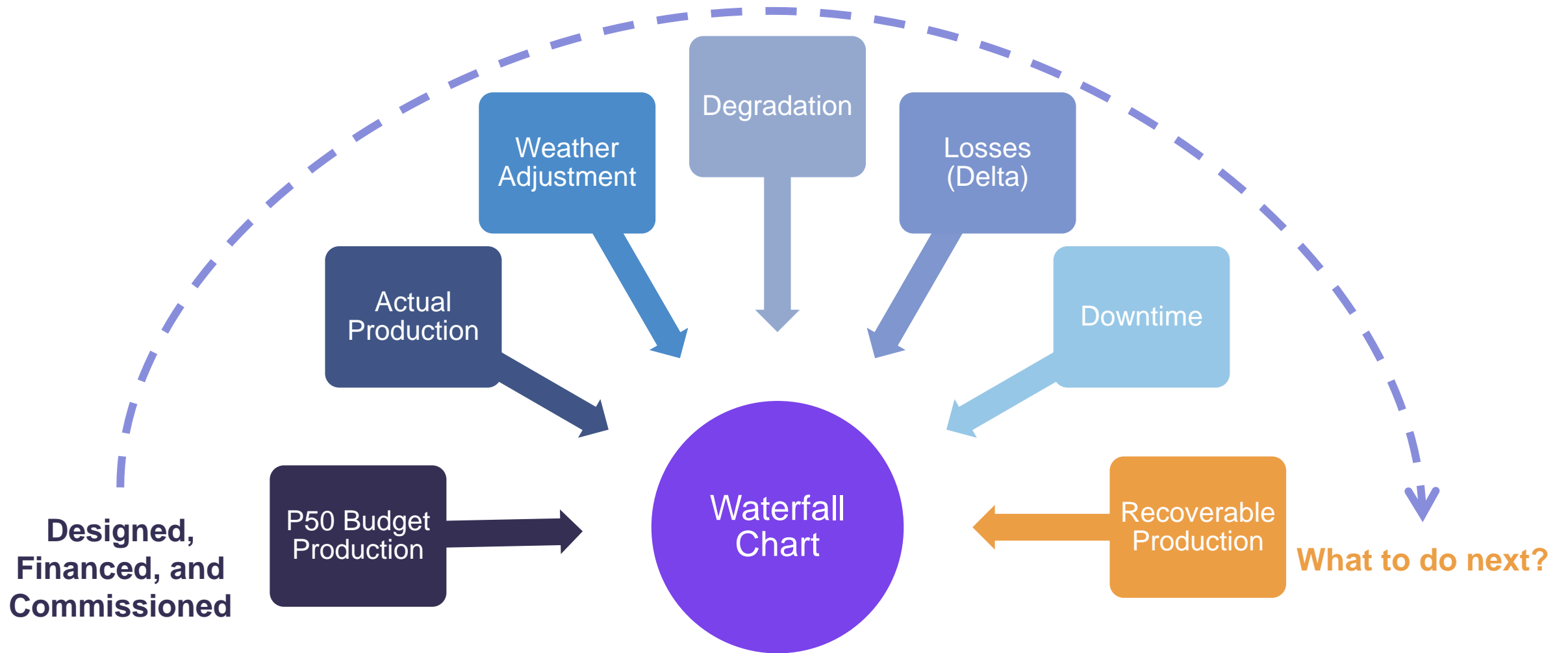
Performance Comparison

Data-Driven Recoverable Actions



# Waterfall Chart

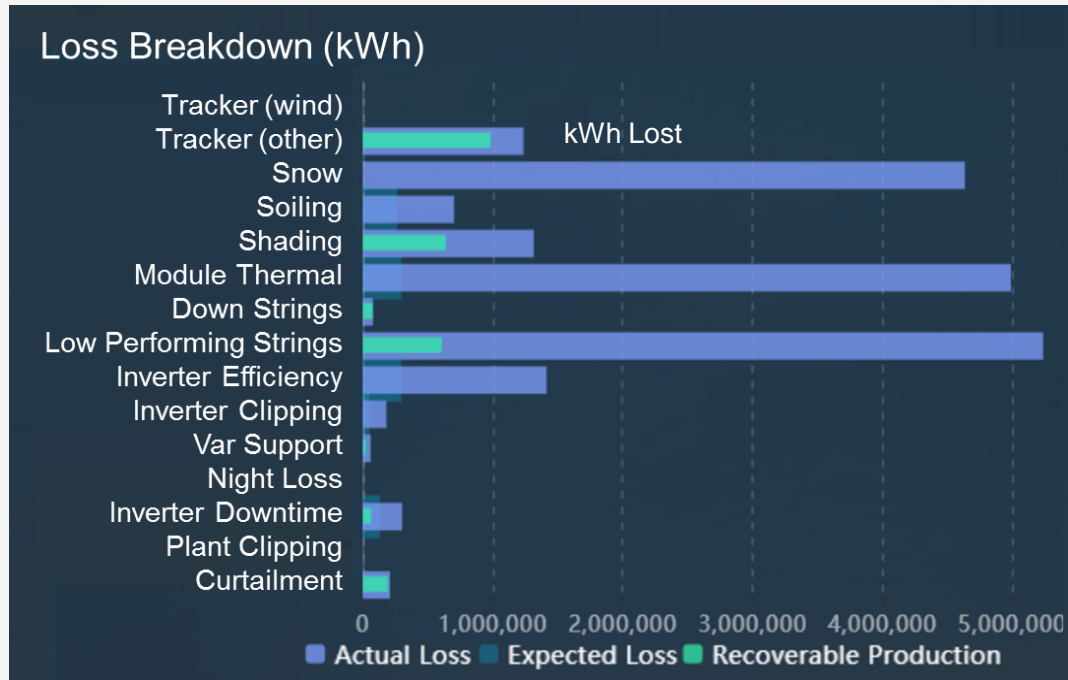
## Today's Performance



How does this all impact LCOE?

# Expected Yield Improvements with Bazefield Solar AA

## Step 1: Break Down Energy Loss



## Step 2: Translate Energy into Revenue Loss

Tracker (other)	
Expected Loss:	\$0
Actual Loss:	\$80,525

↓ Positive ROI to fix?

## Step 3: Assess Cost Benefit to Field Fix

Recoverable Production:	\$64,038
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Recoverable production is the production that could be added to the actual production by taking all cost-effective corrective actions.

# Yield Improvements with Advanced Tools

## Step 4: Prioritized Field Actions



+450 sites      12 GW      1-year data

Action Category	Recommended Action	Weekly impact
Tracker non-wind stow	Adjust tracker's backtracking schedule to minimize shade	\$9,784
INV46A	Adjust tracker's backtracking schedule to minimize shade	\$228
INV46B	Adjust tracker's backtracking schedule to minimize shade	\$227
INV50A	Adjust tracker's backtracking schedule to minimize shade	\$183

### CORRECTIVE ACTIONS

#### IMPROVEMENT OPPORTUNITIES

#### AVERAGE

Tracker non-wind stow	0.5 %
Backtracking schedule	0.4 %
Down string totals per inverter	0.1 %
Down DC input totals per inverter	0.1 %
Low combiner string performance	0.1 %
Low inverter input performance	0.9 %
Inverter efficiency outlier	0.1 %
VAr support affecting production	0.1 %
Inverter self-restart	0.1 %
Inverter down for several days	0.3 %
Multiple invs down for > 1 day event	0.1 %
Grid curtailment	2.0 %
Partial capacity loss	0.3 %

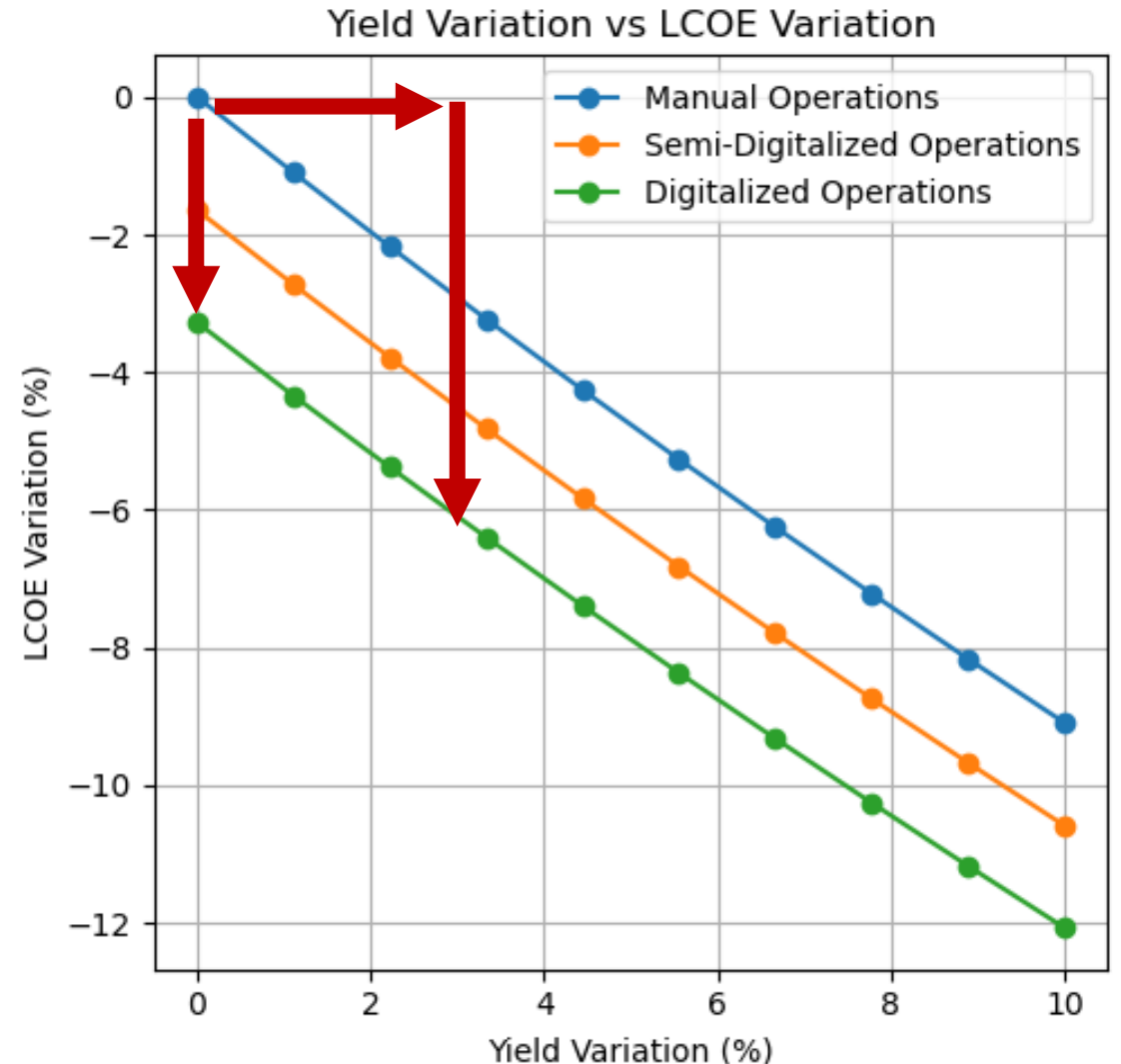
**Total Potential Yield Gain (w/o Curtailment) 3.2 %**

Total Potential Yield Gain (with Curtailment) 5.2 %

# LCOE and Digitalization - Simulation

$$\frac{\text{Levelized Cost of Electricity}}{\text{Energy produced over lifetime}} = \frac{\text{Costs over lifetime}}{\text{Energy produced over lifetime}} = \frac{\$}{\text{MWh}}$$

LCOE Factors	Manual	Digitalized
- Lifetime [years]	30	same
- Discount rate [%]	5	same
- Initial Yield [kWh/kWp/y]	1670	same
- CAPEX [EUR/Wp] 1.11		<b>+0.2% Relative</b>
- <b>More hardware and IT infrastructure</b>		
- OPEX [EUR/kWp/year] 10		<b>-20% Relative</b>
- <b>More visibility on system performance</b>		
- <b>More Proactive, Less Reactive</b>		
- Degradation Rate [%/a] 0.75		<b>-10% Relative</b>
- <b>More maintenance on PV Modules and devices</b>		
- <b>More Long-term reliability</b>		



To summarize...

# With advanced digitalization, you get



Effective stakeholder interaction



Increased PV yield & more GWs



Significant drop in LCOE



Long-term asset reliability

Thank You  
Meet Univers at **Booth B5-120**

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