Technical Crash Course on the PI System

Roberta Rossetti
Systems Engineer

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Where are we in the PI System Introduction

Landscape

PI System & the Greater Operational Data Landscape

Crash Course

Technical Crash Course on the PI System

Asset Monitoring

Intro to Asset Monitoring and Condition-based Maintenance with the PI System

Analytics

Introduction to Analytics with the PI System

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You might be wondering…

What can I do with the PI System?

How to describe the PI System to my coworkers back at the office?

What PI System Tools should I focus on?

How to navigate PI World 2019?

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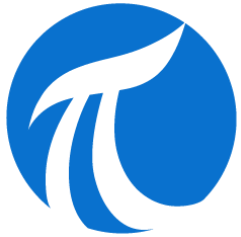
What can I do with  ?

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Asset Health

Process Optimization

Quality Tracking

Energy Efficiency

Regulatory Compliance

Safety & Security

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Asset Health

Problem

Wind Farm can’t meet generation targets

Why?

Wind Turbine availability is low due to curtailment and unplanned downtime

Target

Increase Wind Turbine availability to 95%

How?

Find biggest cause of lost production

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Let’s see the PI System IN ACTION!

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PI Vision - Windtopia Ho

Secure | https://picspreview.osisoft.com/PIVision/#/Displays/160619/Windtopia-Home

OSIsoft PI Vision

New Display | OSI\jmaytum

Windtopia Home | Asset: Windtopia+ | Ad Hoc Display

Windtopia

Total Production	Expected Production	Turbines Available	Daily Revenue
8,187.5 kW	7,878.5 kW	100 %	2,789.2 $

Big Buffalo Wind Farm

Expected Power: 3,495.7 kW

Current Power: 3,559.6 kW

0 1,000 2,000 3,000 4,000 5,000

Actual Capacity Factor: 49 %

0 10 20 30 40 50 60 70 80 90 100

Availability Factor: 65 %

0 10 20 30 40 50 60 70 80 90 100

Black Mesa Wind Farm

Expected Power: 2,108.7 kW

Current Power: 2,491.1 kW

0 1,000 2,000 3,000 4,000 5,000

Actual Capacity Factor: 80 %

0 10 20 30 40 50 60 70 80 90 100

Availability Factor: 44 %

0 10 20 30 40 50 60 70 80 90 100

Black Wolf Wind Farm

Expected Power: 2,274 kW

Current Power: 2,136.9 kW

0 1,000 2,000 3,000 4,000 5,000

Actual Capacity Factor: 42 %

0 10 20 30 40 50 60 70 80 90 100

Availability Factor: 74 %

0 10 20 30 40 50 60 70 80 90 100

1/3/2018 8:37:48 PM | 1d | Now | 1/4/2018 8:37:48 PM

How to describe the PI System?

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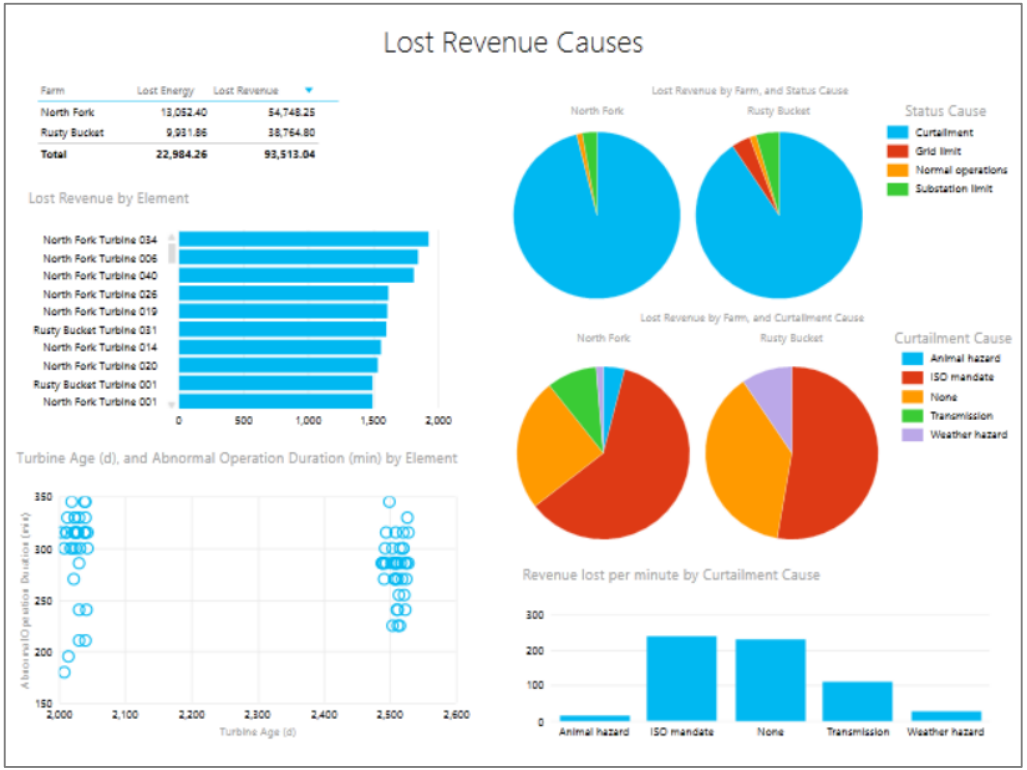
Let’s compare creating this report

Without the PI System

and

With the PI System



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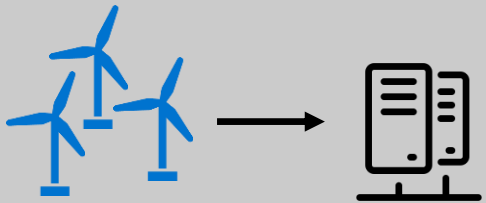
Without the PI System

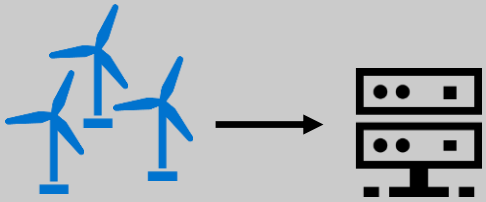
Corporate

Lost Production

North Fork



Springfield



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Without the PI System

Corporate

Step 1 *– Gather turbine status data from sites*

Lost Production

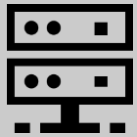
NF Wind Turbine
Status raw data

RB Wind Turbine
Downtime Report

North Fork

SCADA 1

Springfield



SCADA 2

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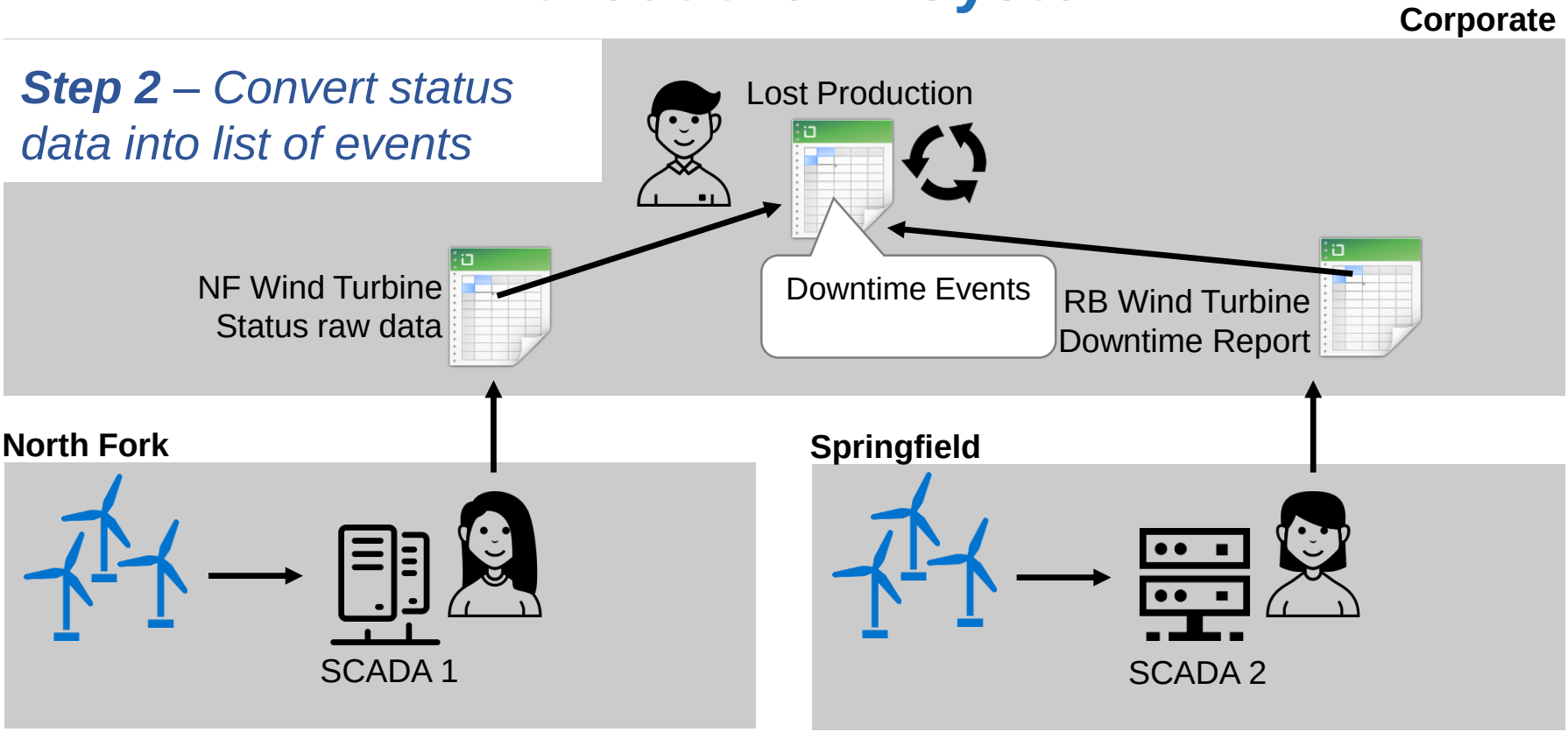
Without the PI System



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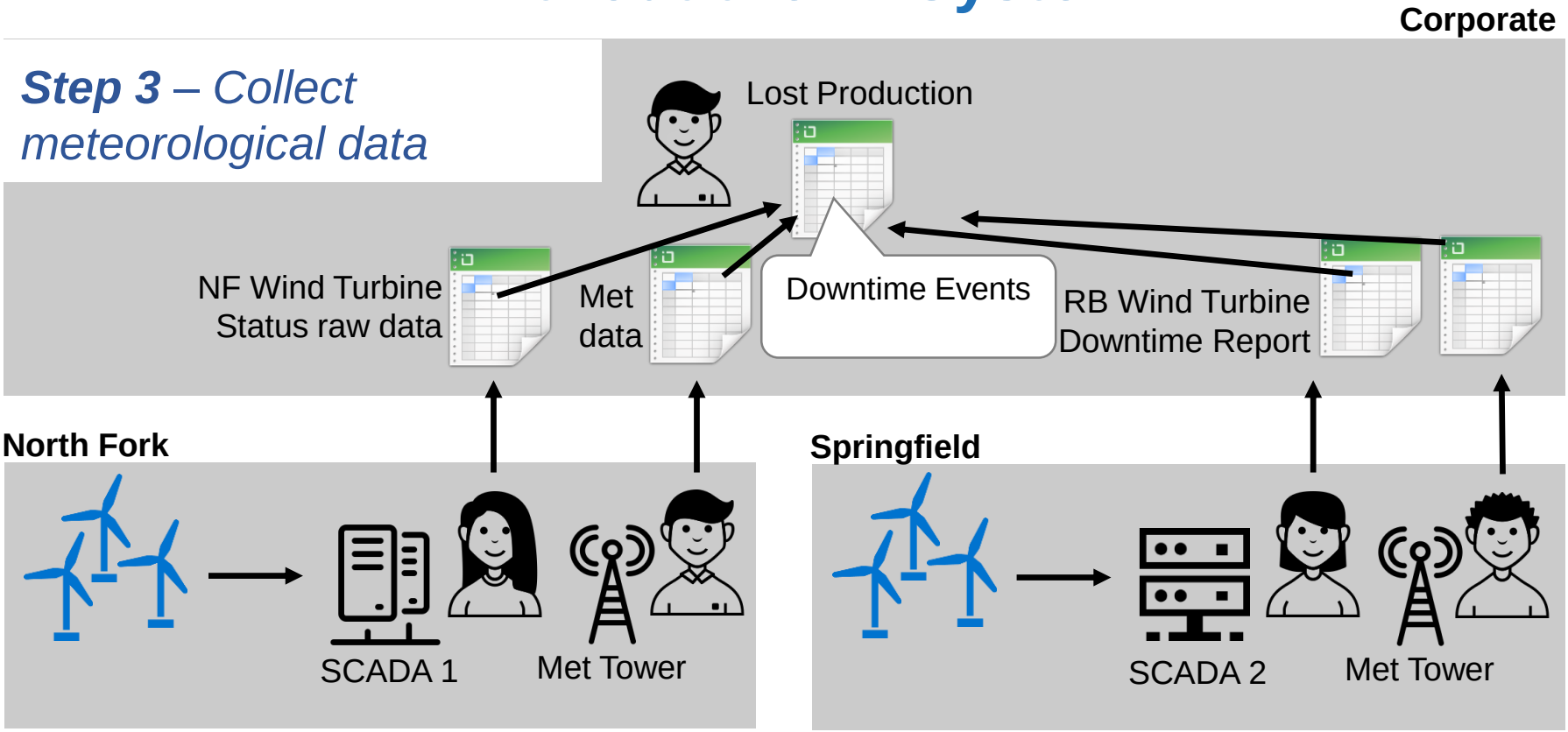
Without the PI System



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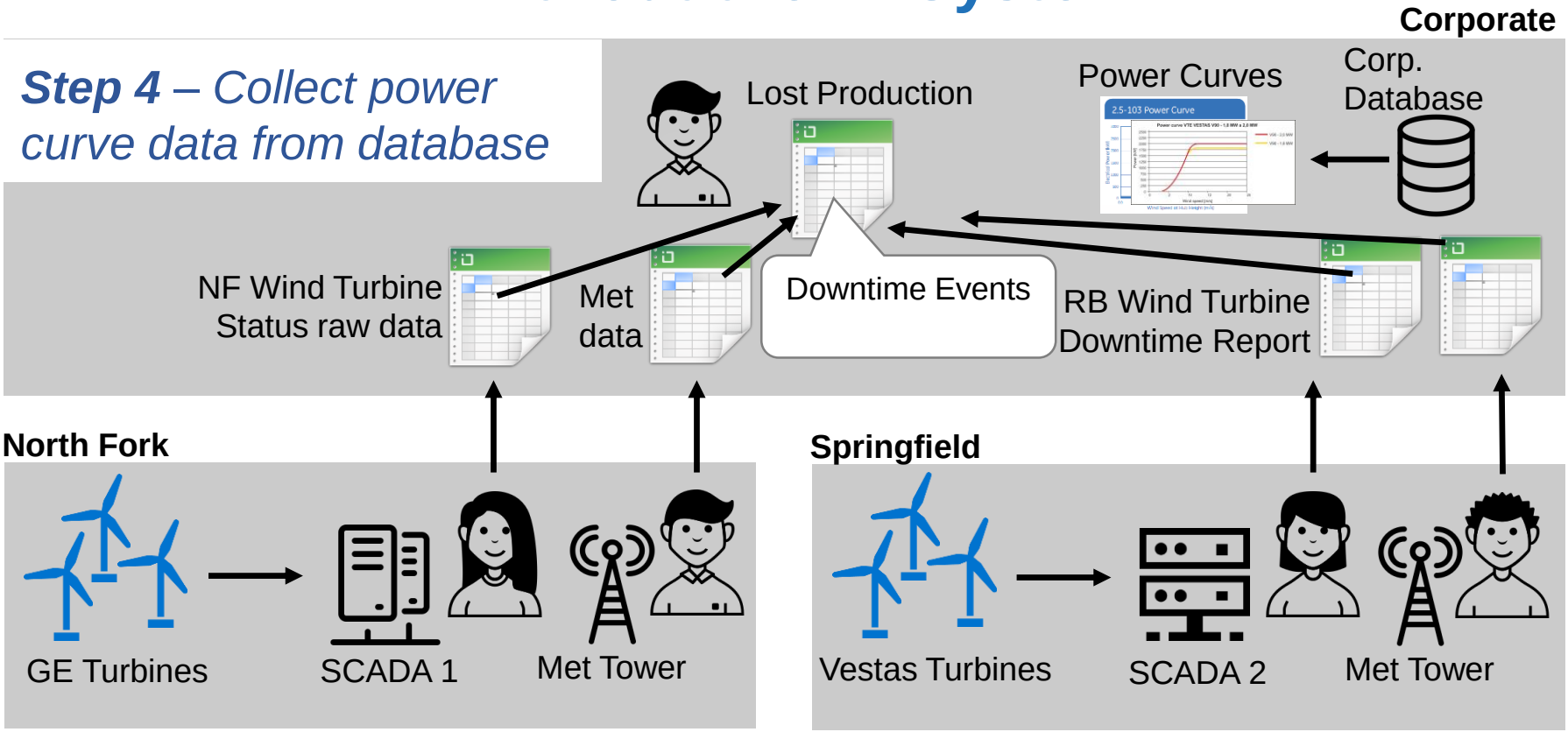

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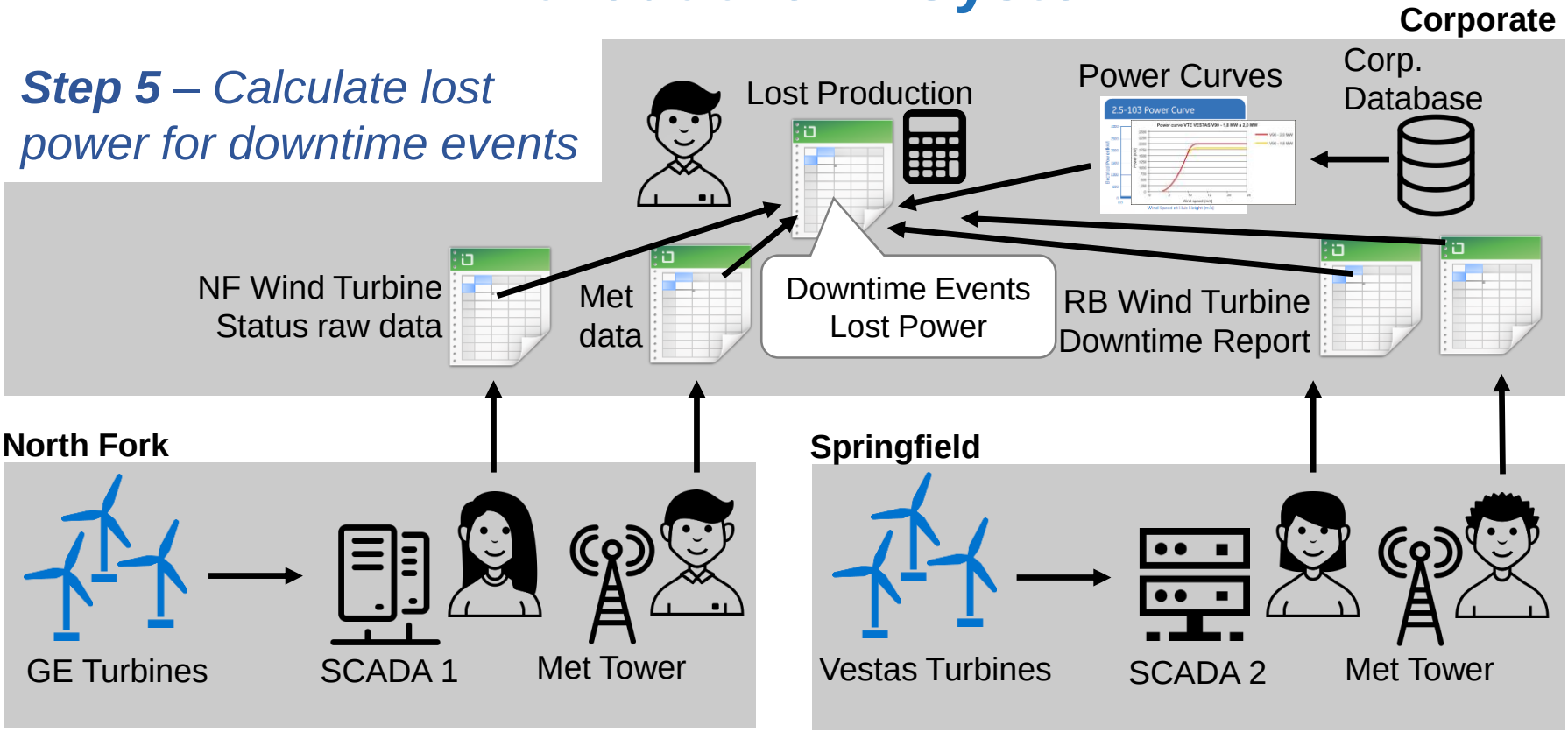

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Without the PI System

Corporate

***Step 6** – Publish the report!*

NF Wind Turbine Status raw data

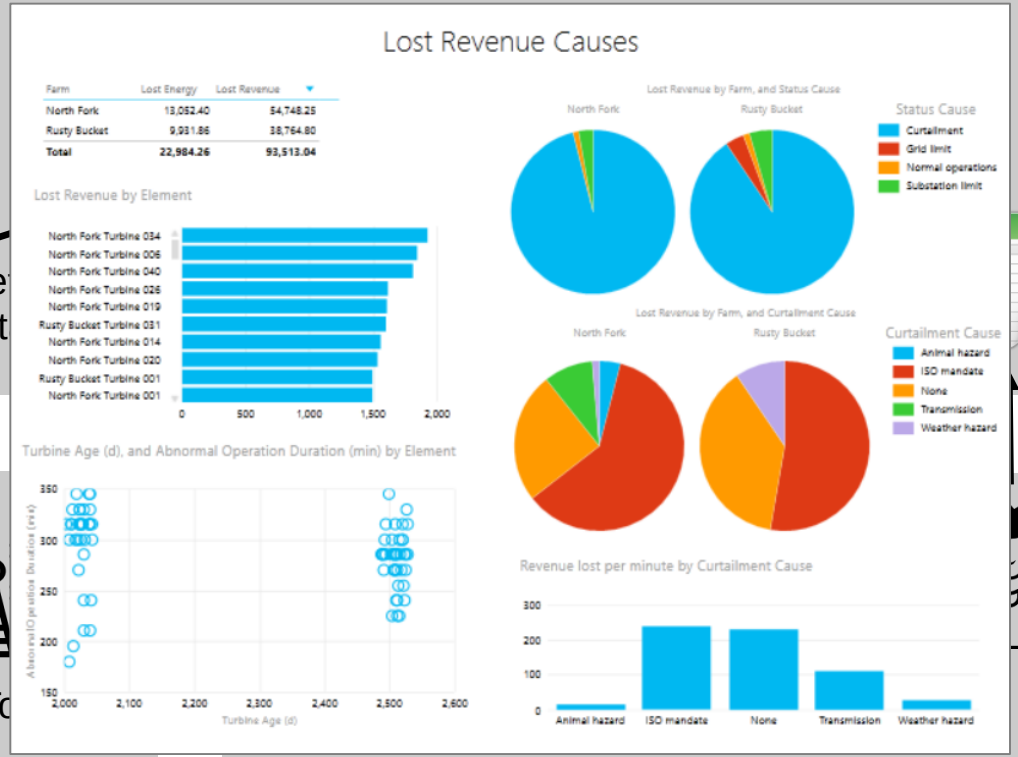
Met dat

North Fork

GE Turbines

SCADA 1

Met To



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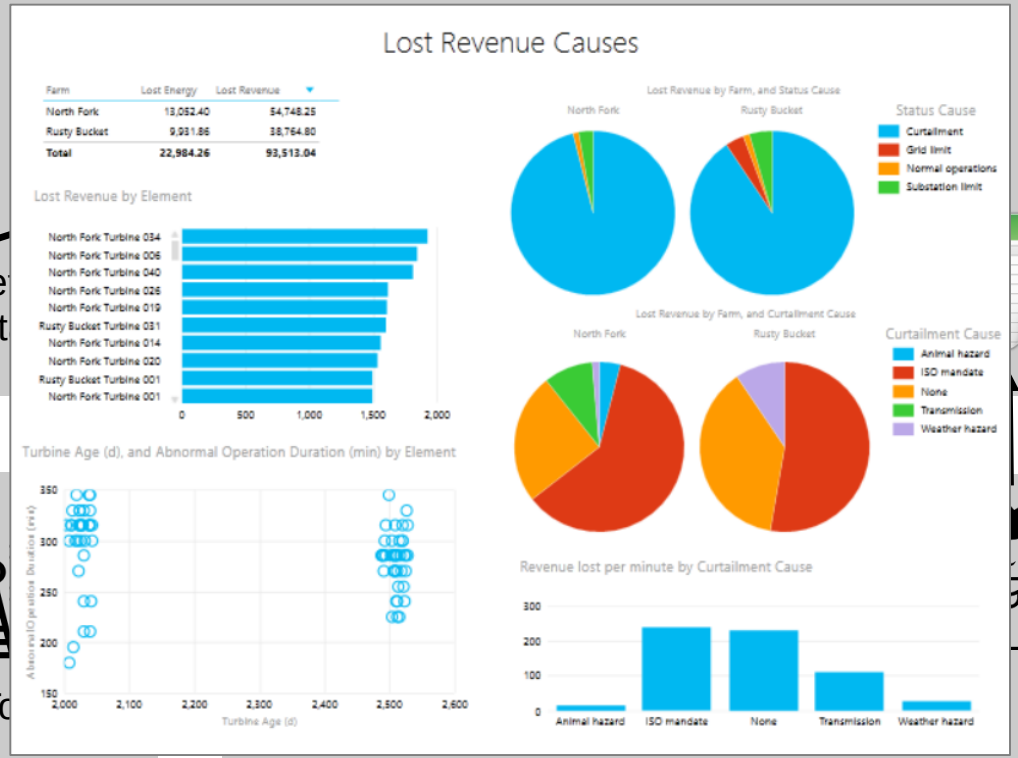
Without the PI System

Corporate

***Step 6** – Publish the report!*
… then start over next week

NF Wind Turbine
Status raw data

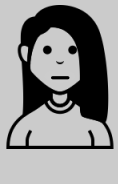
Met
dat



North Fork

GE Turbines

SCADA 1



Met To

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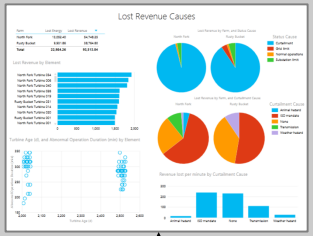
With the PI System

Site operations data collection
External database integration
Real-time analytics and events
Automated BI reporting

Corporate



Corp. Database

Automated Report

OSIsoft. **PI System Infrastructure**

Downtime
Lost Power

North Fork

GE Turbines → SCADA 1 → Met Tower

Rusty Bucket

Vestas Turbines → SCADA 2 → Met Tower

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What PI System tools do I need?

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What type of solution are you looking for?

- **Collect Data from Disparate Systems**
- **Create Calculations for Assets**
- **Identify and Capture Important Events**
- **Visualize and Share Data**
- **Deploy Business Intelligence (BI) & Machine Learning**

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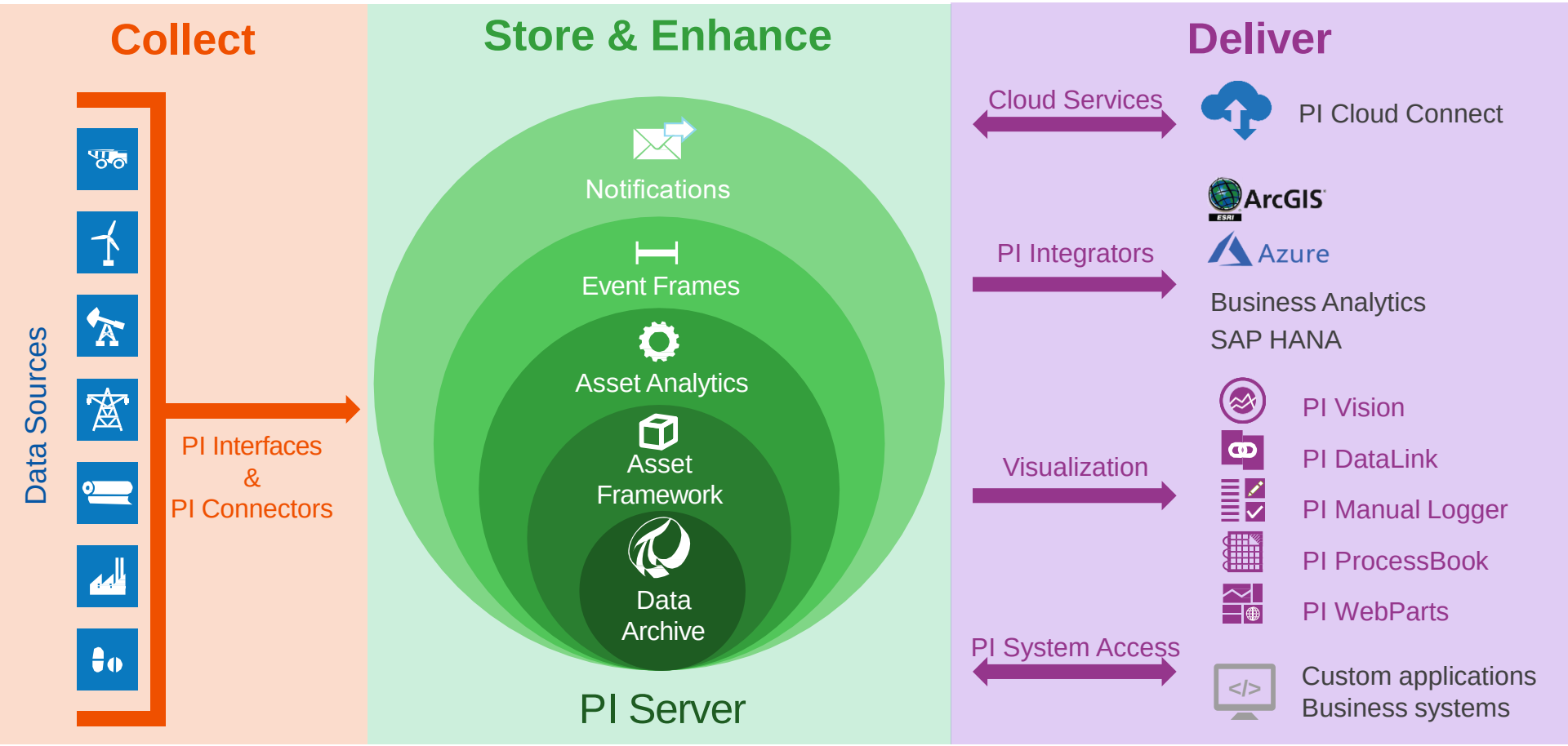

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Collect Data from Disparate Systems

“PI Connectors & PI Interfaces”

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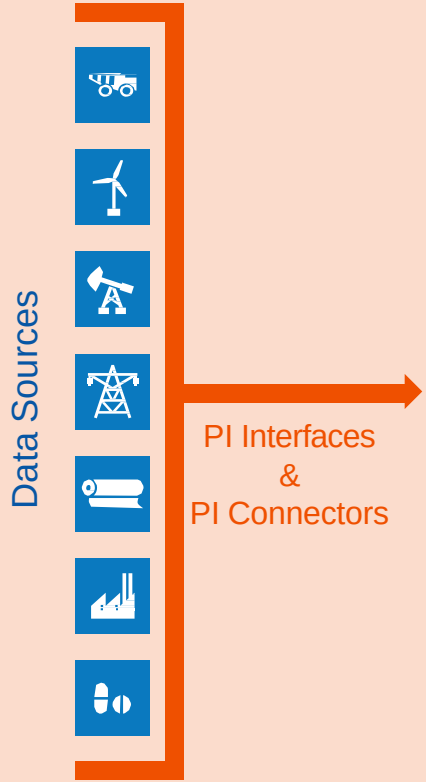
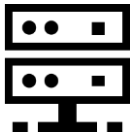
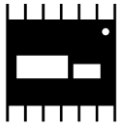
Collect



Collects **time-series** and **meta-data** from any source


DCS


PLC

SCADA

IoT Sensors

Databases

We have developed over **450** PI Interfaces and PI Connectors

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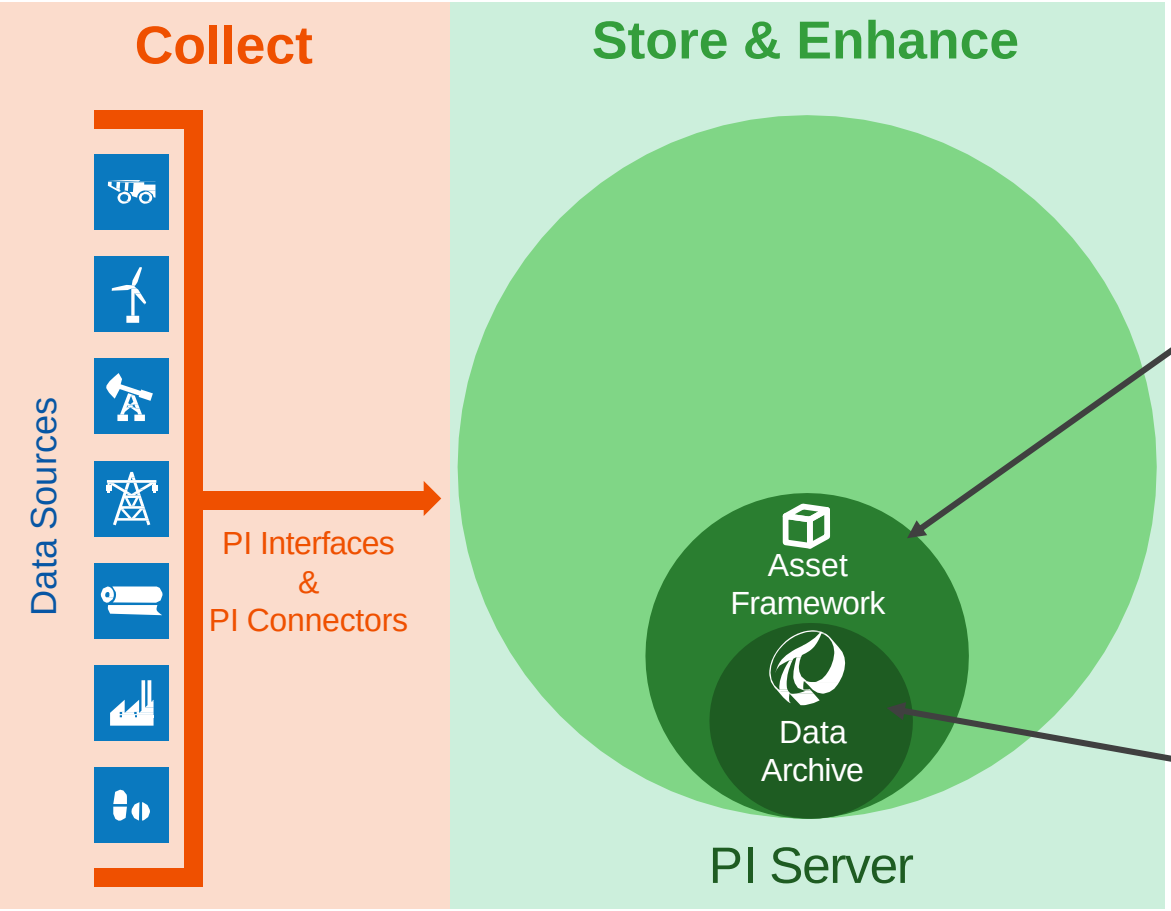

Meta-data stored in the **Asset Framework**

- Manufacturer
- Longitude
- Latitude

Raw time-series data is stored in the **Data Archive**

Turbine Status	ON
Active Power	317
Nacelle Position	304

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Create Calculations for Assets

“Asset Framework & Asset Analytics”

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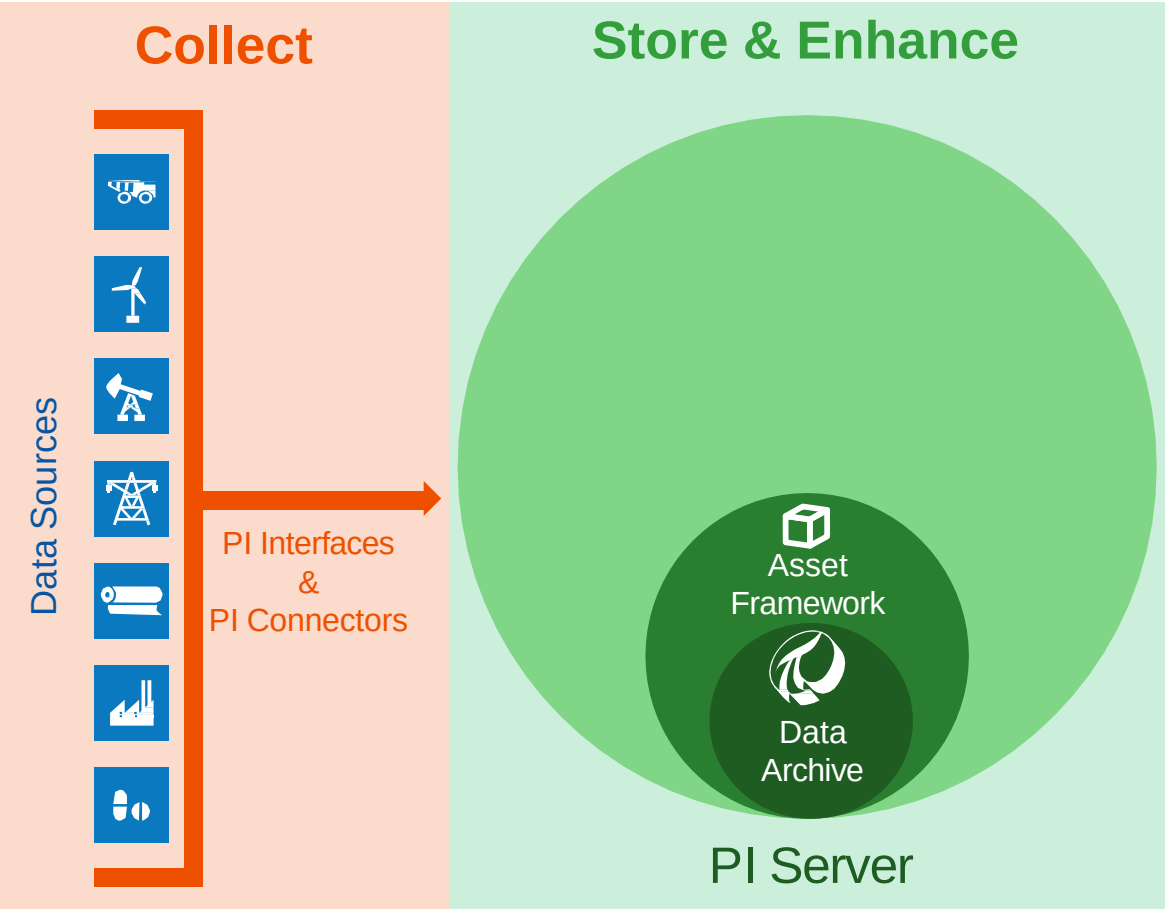

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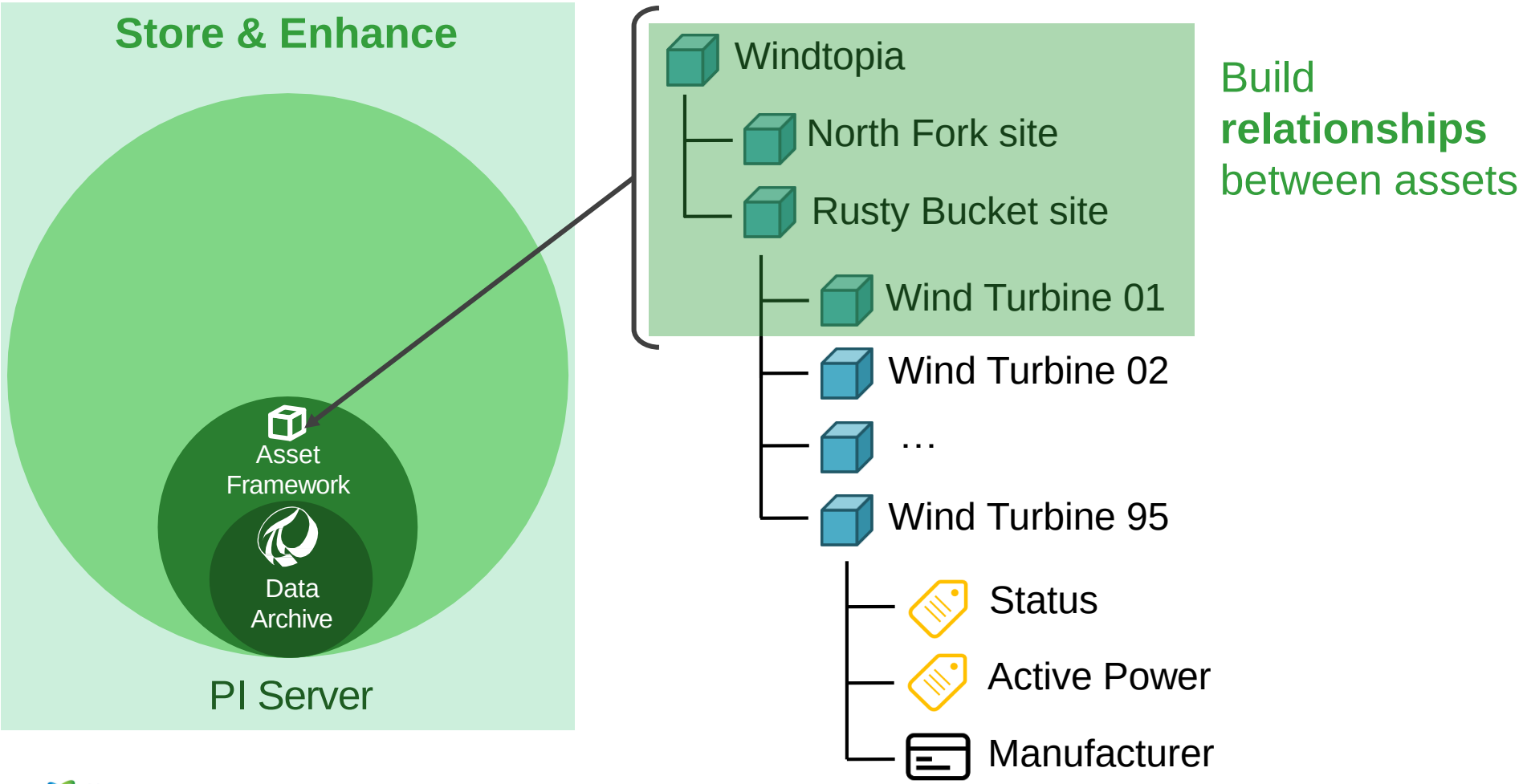

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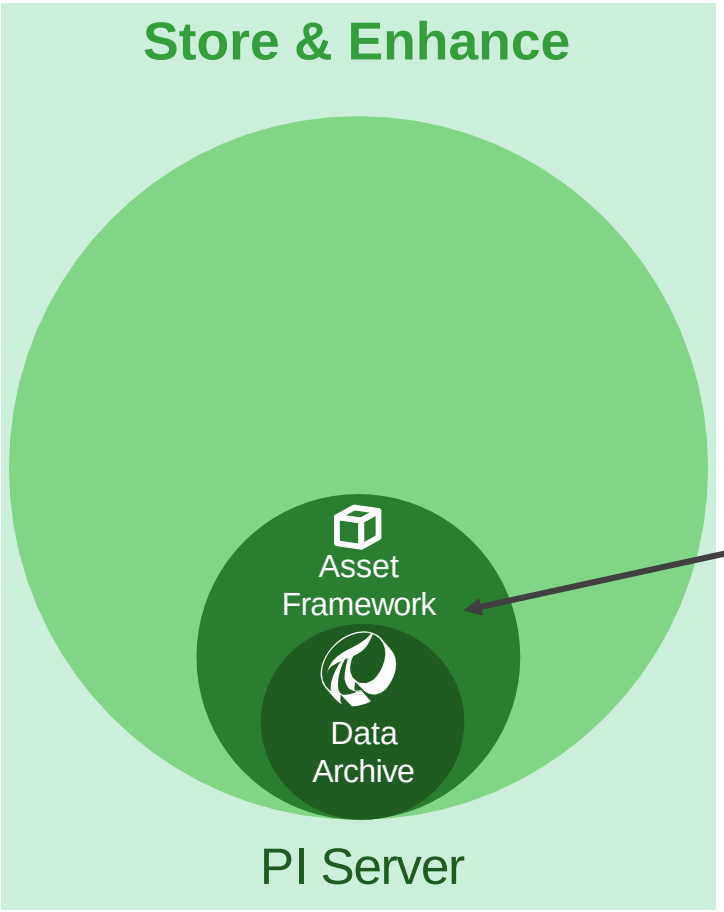

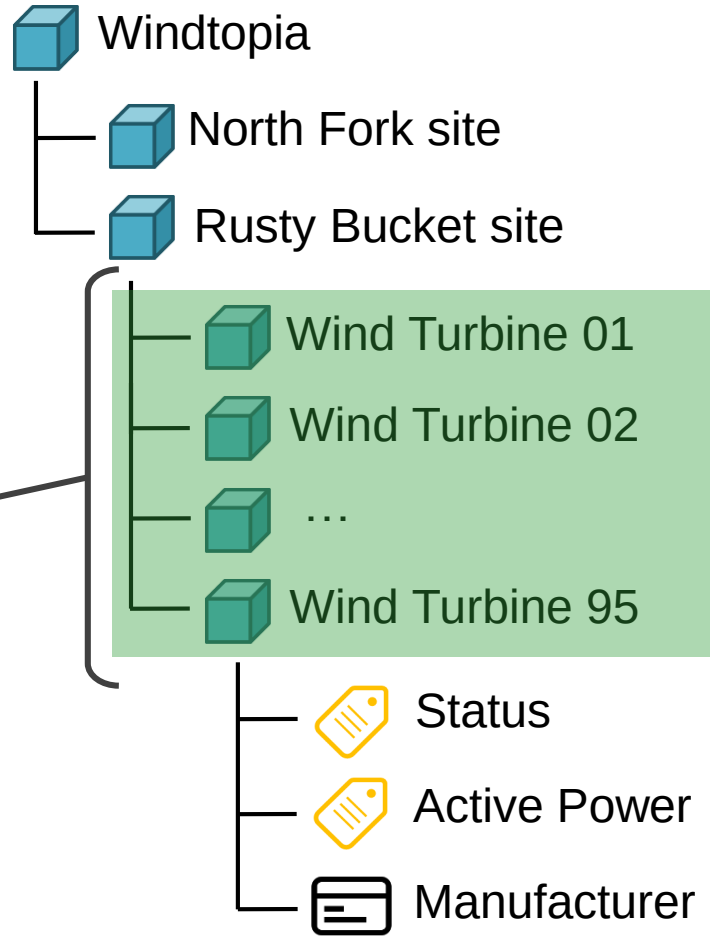

Build **templates** for common assets

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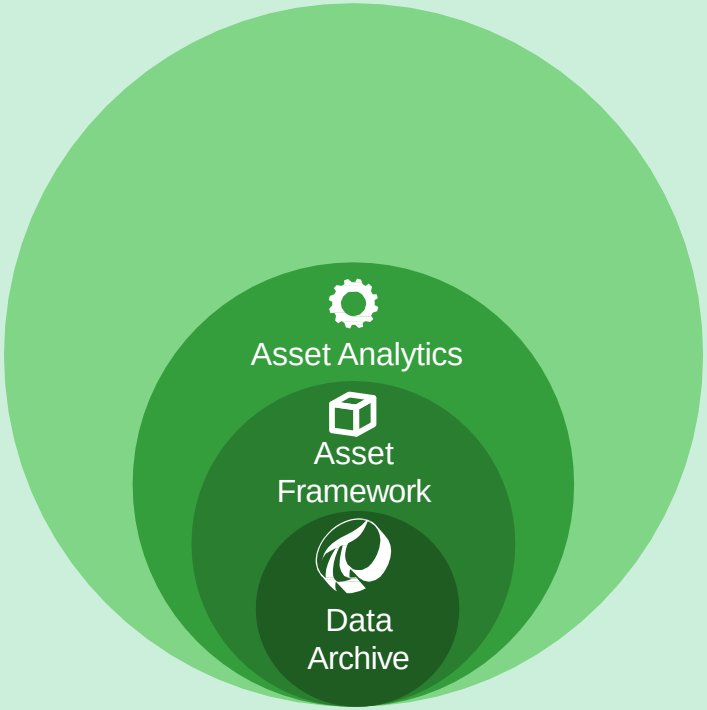
Store & Enhance



PI Server

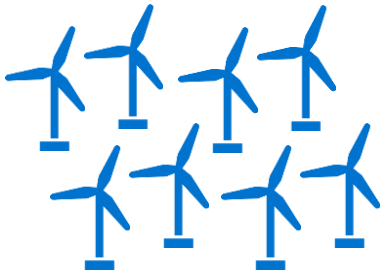
Wind Turbine Template

Hourly Energy Production

Power Factor

Build real-time analytics on templates…

… deploy them to your entire fleet…



North Fork site

Total Energy Production

Average Power Factor

… and roll it up to the site

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Identify and Capture Important Events

“Asset Framework & Event Frames”

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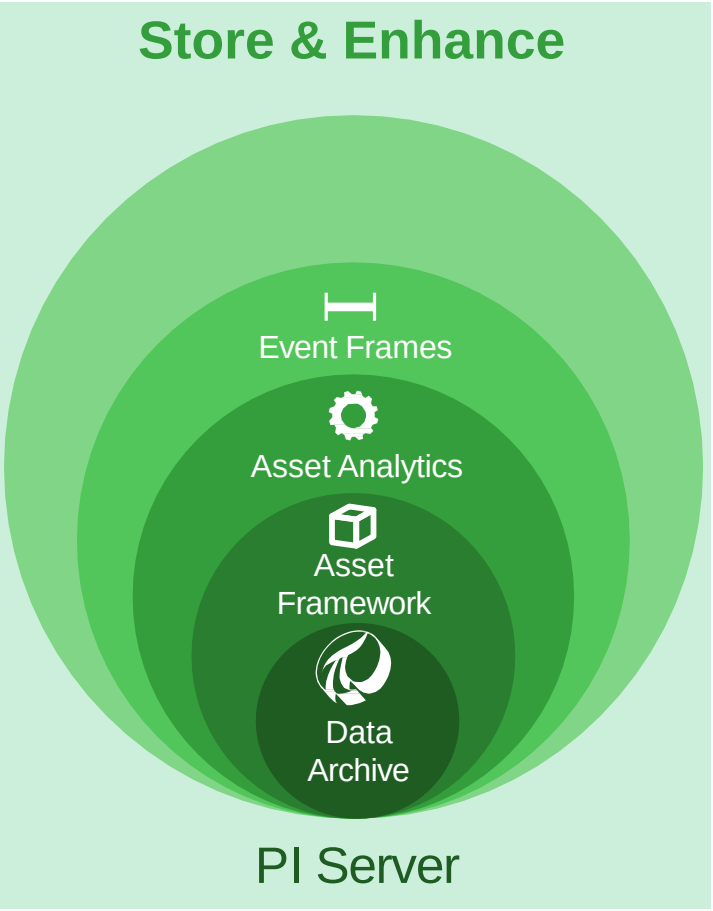
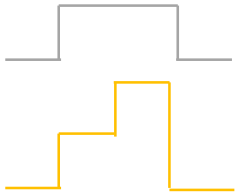


Store event context

- Gearbox overheating
- Downtime
- Turbine Curtailment

Triggers:

User Defined



External Systems

DeltaV, Syncade, Rockwell Automation, GE Fanuc, ABB, Foxboro, werum, Siemens, Wonderware, Honeywell

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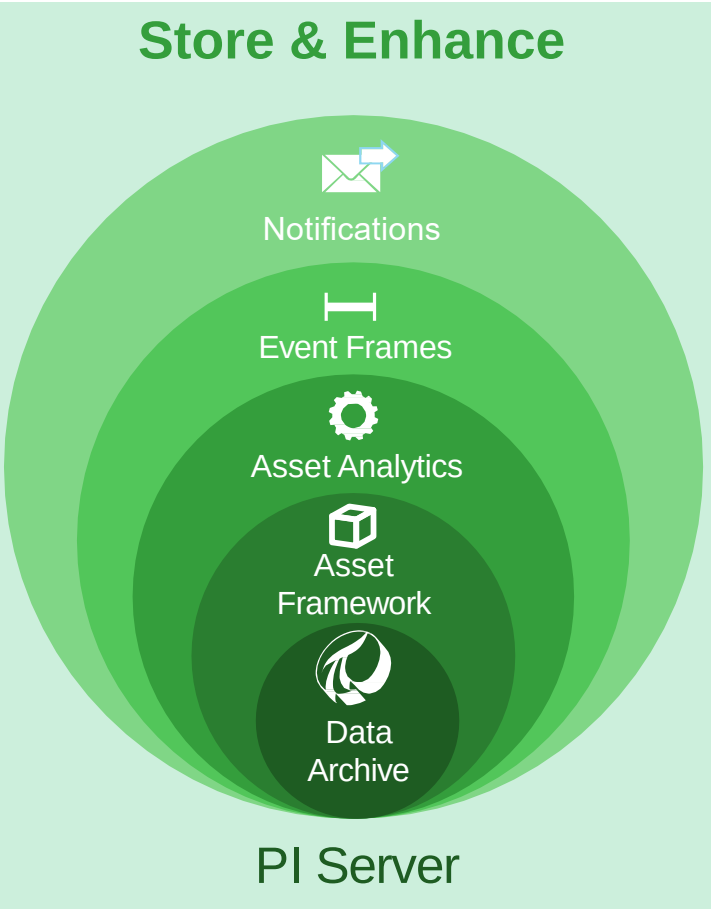
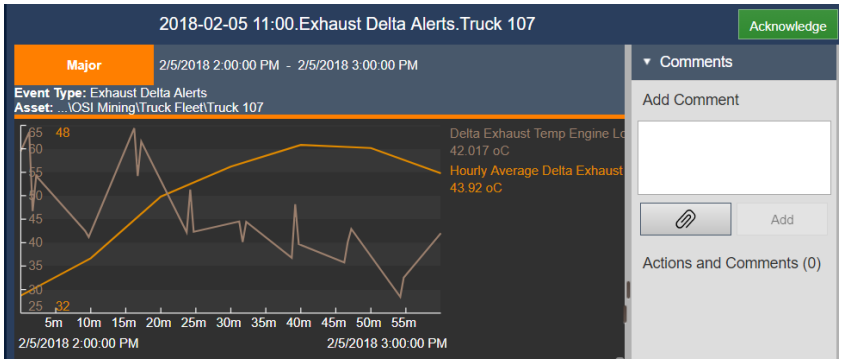


Notification on important events

Gearbox overheating

Notification



Operator can **view**, **acknowledge** and **comment** on event

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Visualize and Share Data

“PI Vision & PI DataLink”

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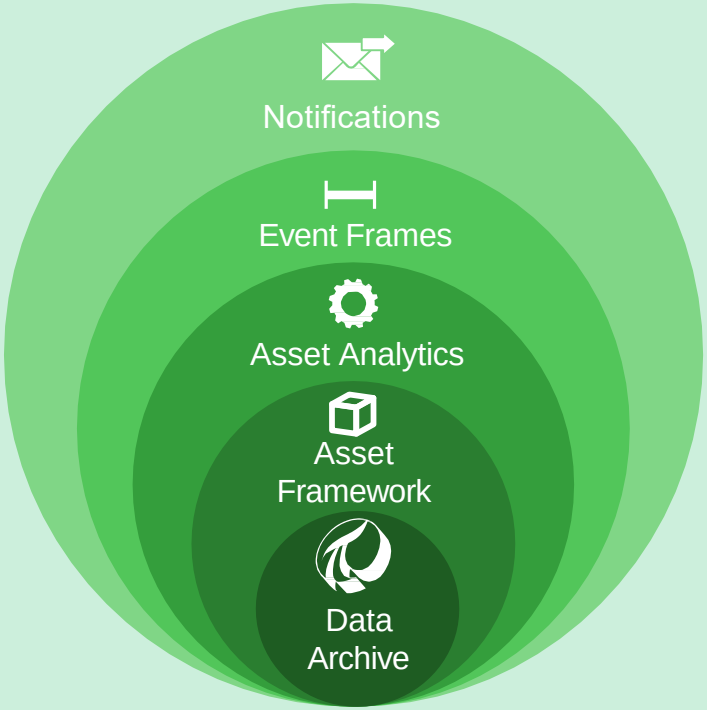
Store & Enhance



PI Server

Deliver

Cloud Services

PI Cloud Connect

PI Integrators

ArcGIS

Azure

Business Analytics

SAP HANA

Visualization

PI Vision

PI DataLink

PI Manual Logger

PI ProcessBook

PI WebParts

PI System Access

Custom applications

Business systems

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PI Vision

PI System's flagship visualization tool

Designed with collaboration in mind
Display editing and visualization
Use any device
Extensible

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PI DataLink

	A	B	C	D	E	F
1	company name					
2		Area		Line 1		
3	From	Unit		Injection Mold 1		
4	05/23/2017 00:00:00	Target	Production	Scrap	Scrap	Average Temperature
5	To	Count	Count	Count	%	F
6	05/24/2017 00:00:00					
7	0:00	580	560	40	7.14%	459.89
8	1:00	500	502	29	5.78%	459.77
9	2:00	580	573	27	4.71%	460.10
10	3:00	580	572	28	4.90%	460.54
11	4:00	580	571	29	5.08%	460.04
12	5:00	580	574	26	4.53%	460.08
13	6:00	500	466	40	8.58%	460.25
14	7:00	580	572	28	4.90%	460.08
15	8:00	500	490	22	4.49%	459.53
16	9:00	580	574	26	4.53%	460.58
17	10:00	500	259	132	50.97%	429.49
18	11:00	580	303	87	28.71%	429.61
19	12:00	580	312	87	27.88%	430.62
20	13:00	500	236	129	54.66%	430.14
21	14:00	580	290	93	32.07%	429.97
22	15:00	580	435	62	14.25%	444.72
23	16:00	580	575	25	4.35%	460.79
24	17:00	580	570	30	5.26%	459.75
25	18:00	580	574	26	4.53%	459.83
26	19:00	580	576	24	4.17%	459.84
27	20:00	500	437	20	4.58%	460.35
28	21:00	580	307	76	24.76%	429.87
29	22:00	580	572	28	4.90%	459.47
30	23:00	580	568	32	5.63%	459.73

PI System data in Microsoft Excel

Pull in raw data, calculations, events, filtered data
Leverage Excel functionalities
Automated reporting

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Deploy Business Intelligence (BI) & Machine Learning

“PI Integrators”

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PI Integrators

Prepare, clean and deliver PI System data to external systems

BI Tools

Data Warehouse

Data Lake

Messaging Hub

Geospatial

ArcGIS ESRI

Deliver

PI Integrators

- Azure
- AWS
- GCP
- SAP HANA
- Hadoop
- Esri ArcGIS

Visualization

- PI Vision
- PI DataLink
- PI Manual Logger
- PI ProcessBook

PI System Access

Custom applications
Business systems

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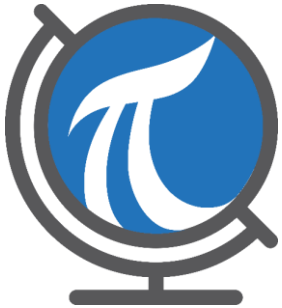

How to navigate PI World?

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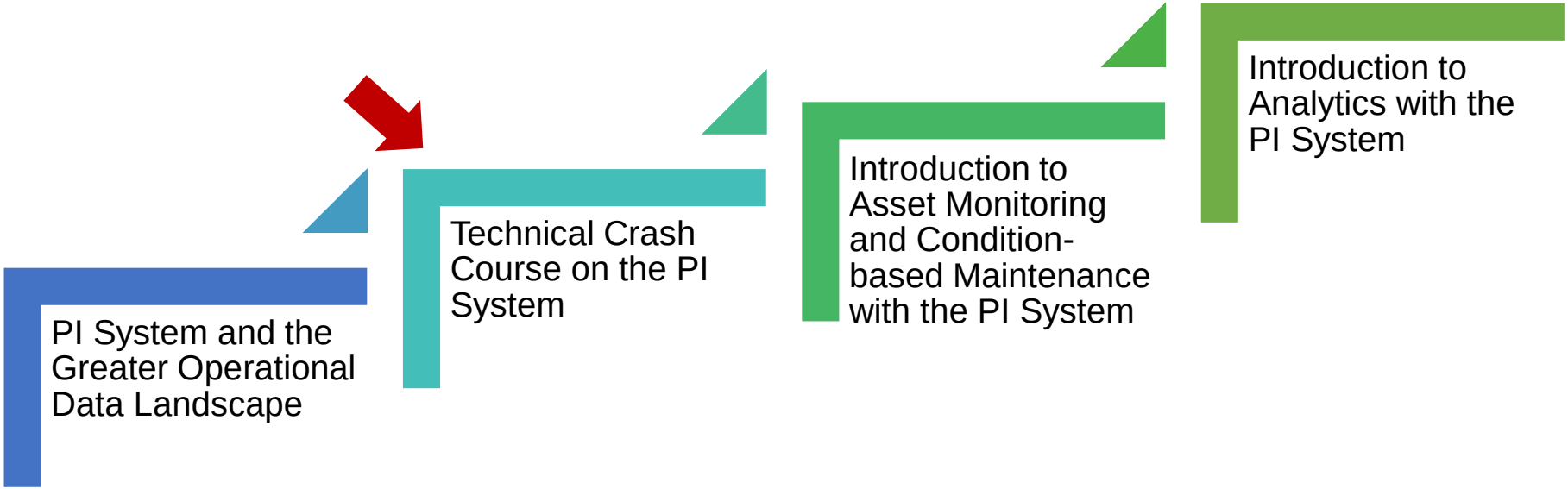
Day 0 - Introduction to the PI System Track



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Day 1 – Operational Intelligence

- ✓ Enterprise Infrastructure
- ✓ Best Practice Tracks

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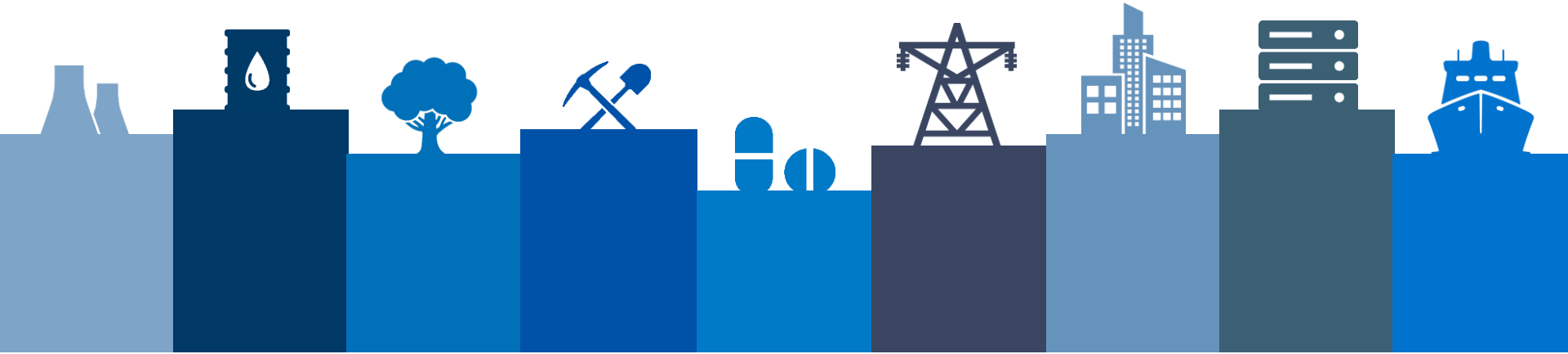
Day 2 – Industry Day: Get Inspired!

- ✓ Various Industry Tracks
- ✓ Industry User Group Meetings



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Day 3 – Product Day & Labs

- ✓ Learn more about individual products
- ✓ Partner & product expo
- ✓ *Hands-on labs – registration required

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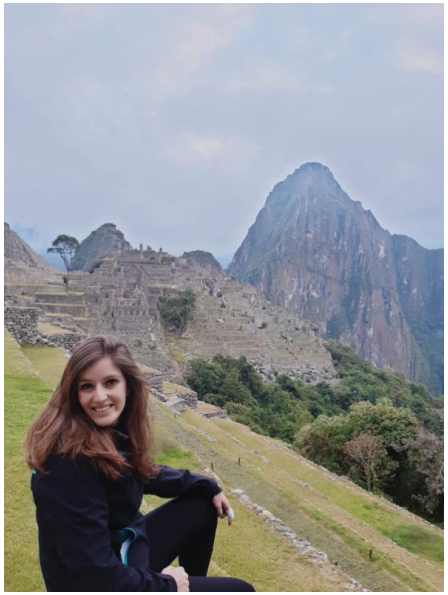
Contact Information



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rrossetti@osisoft.com

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Questions?

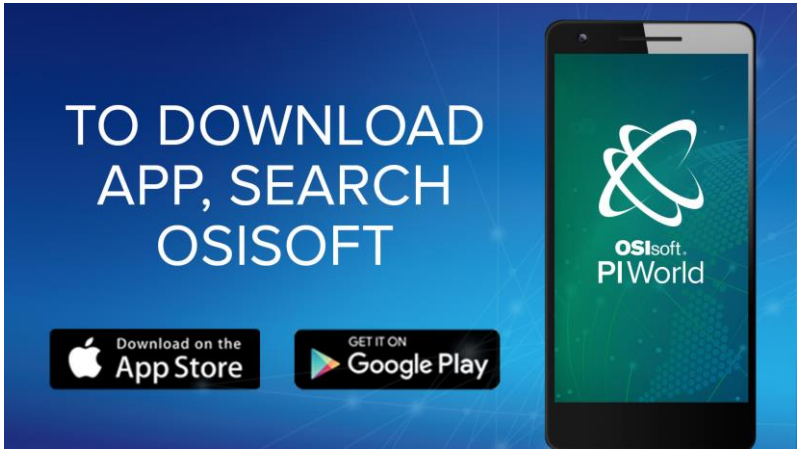
Please wait for the **microphone**

State your **name & company**

Please remember to…

Complete Survey!

Navigate to this session in mobile agenda for survey



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