

OCTOBER 24, 2023

Beyond Boundaries: AVEVA's Convergence of Edge and Cloud for Reshaping Wastewater Management

Presented By: Eric Conder

AVEVA

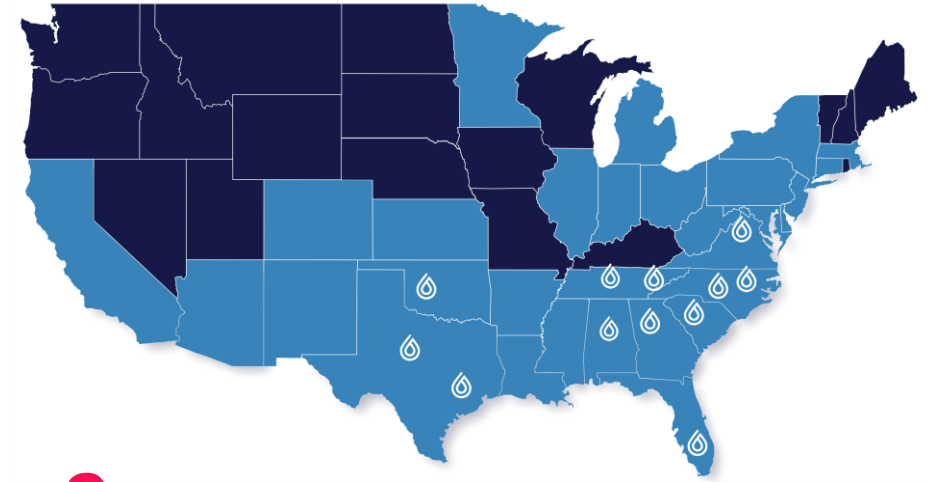
Who is Inframark?

180+
Employees

33+
Years of Service
Excellence

1,500+
Clients Served

1,200
Treatment Projects
Completed



9
Office Locations

CISSP
Certified Cybersecurity
Services

1 MILLION
Data Points Managed
on Cloud Hosted SCADA

AVEVA

Who is Inframark?



- **3,000 dedicated employees** across North America in **25 states**
- **400+** business and municipal clients
- Manages **287 water** and **279 wastewater** facilities
- Manages more than **2,000 lift stations**
- Combined capability of treating more than **1 billion gallons** daily
- **99.9%** regulatory compliance
- **99+%** partnership renewal rate company-wide

Inframark A&I Connects Data Silos and Teams Across the Enterprise

Challenge

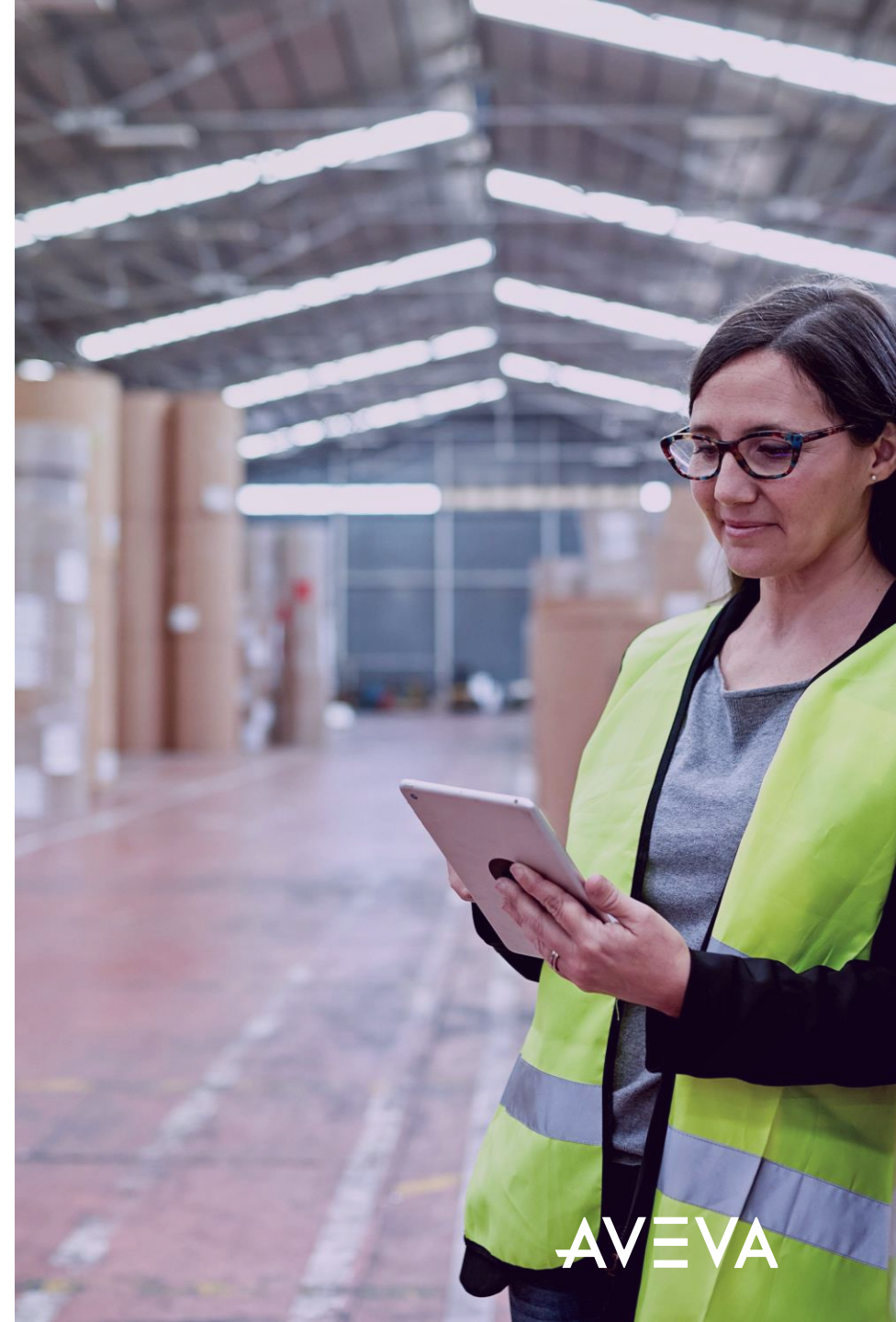
- Use machine learning to discover and explore new insights from existing data.
- Leverage disparate data sources across the enterprise to gain insights into operational efficiencies.
- Find a software stack that will enable any team in the enterprise to access and view the data.

Solution

- Utilize AVEVA Edge, Edge Management, and Data Hub to aggregate the data into an accessible repository. Then, use AVEVA Data Hub, Connect Visualization Services, and Advanced Analytics to discover the operational efficiencies and gain valuable insights.

Results

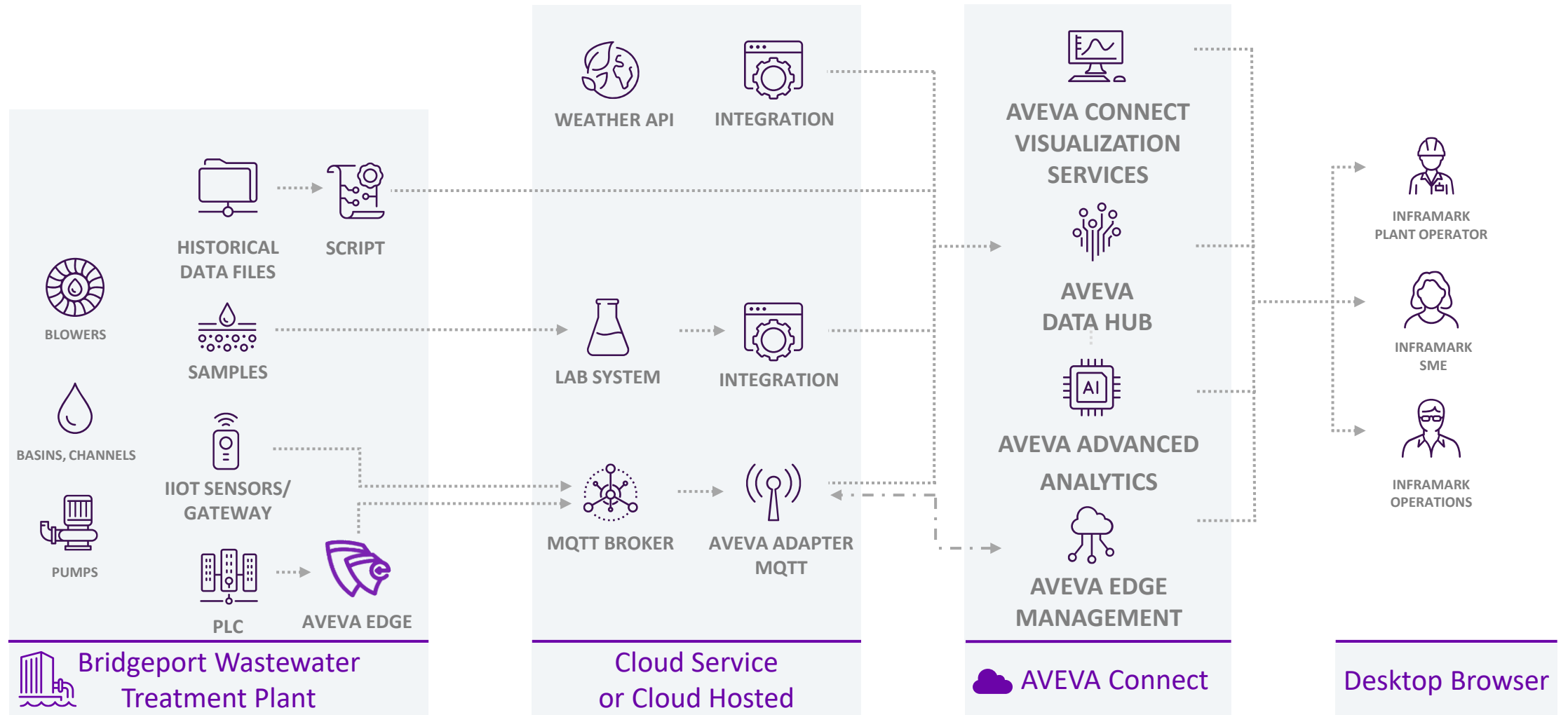
- **Developed a unified namespace to use when aggregating plant data into Data Hub**
- **Combined lab data, SCADA historian data, and real-time data into AVEVA Data Hub**
- **Created assets, visualizations, and AVEVA Advanced Analytics models that can easily be accessed by clients, enterprise users, and anyone else we need to share the information with.**
- **Built a few Advanced Analytics models that we'll continue to refine and operationalize.**



Getting Started



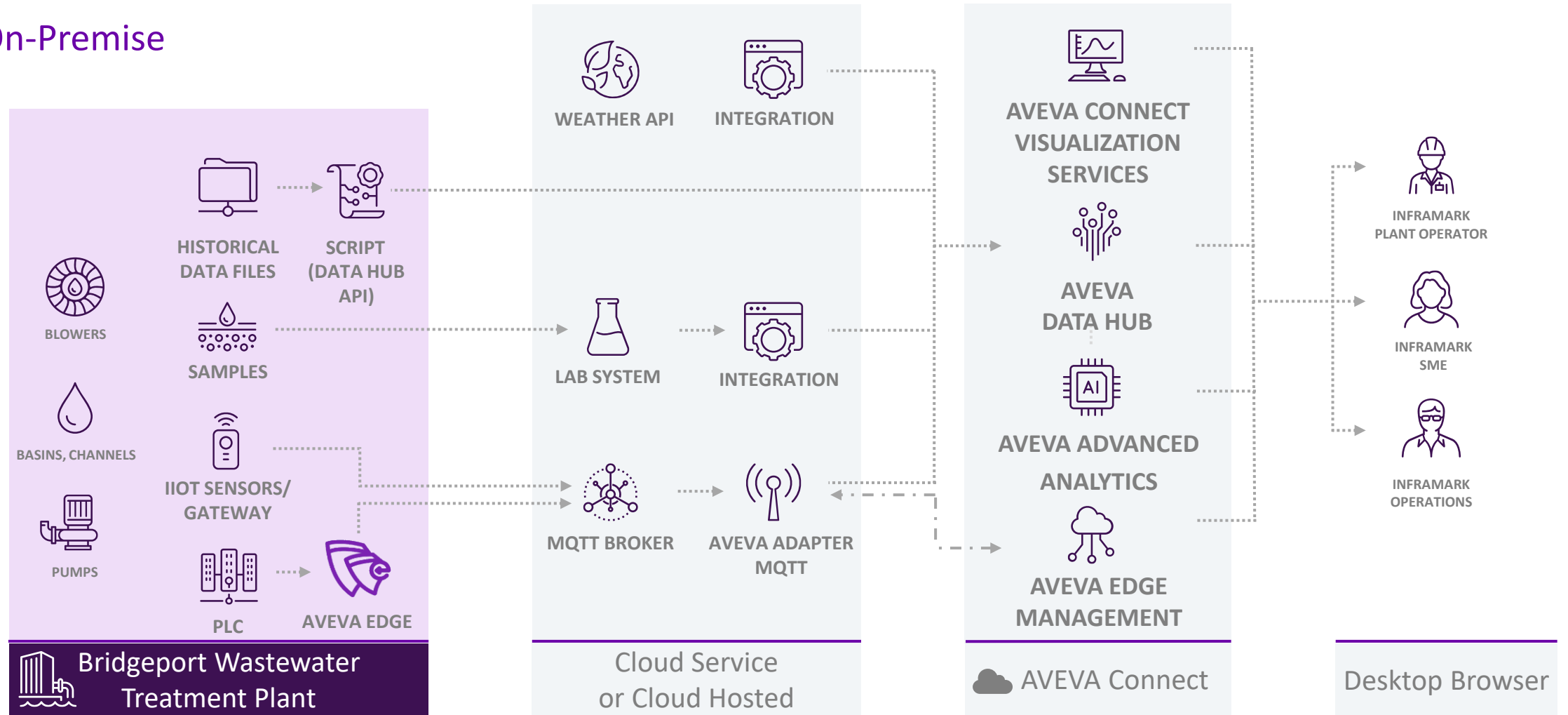
Lighthouse Architecture



Collecting the Data

Lighthouse Architecture

On-Premise



Edge Data Collection

AVEVA Edge On-Premise

- Communicates with plant PLCs
- Transmits data to cloud-based MQTT broker
- Can easily be setup for enterprise-wide deployment

The screenshot displays the AVEVA Edge On-Premise software interface. The main window is titled 'MQTT - MAIN DRIVER SHEET' and 'SRTP - MAIN DRIVER SHEET'. The interface is divided into several sections:

- Project Explorer:** Shows a tree view of the project structure under 'Project: EastsideWWTRAPP'. It includes folders for 'Drivers', 'MQTT', and 'SRTP', each containing a 'MAIN DRIVER SHEET' file. Other folders include 'OPC DA Client (legacy)', 'OPC UA', 'OPC XML/DA', and 'TCP/IP'.
- Description:** A text field containing 'MAIN DRIVER SHEET'.
- Disable:** A text field.
- Read Completed:** A text field.
- Read Status:** A text field.
- Write Completed:** A text field.
- Write Status:** A text field.
- Min:** A text field.
- Max:** A text field.

The central part of the interface is a table with the following columns: Tag Name, Station, I/O Address, Action, and Scan. The table contains 11 rows of data:

Tag Name	Station	I/O Address	Action	Scan
1 NodeName	sp:ssl// :8883	BridgeportCT/Eastside/NodeName	Write	Auto
2 ATG1EST_3	sp:ssl// :8883	BridgeportCT/Eastside/ATG1EST_3	Write	Auto
3 AF1CLS_5	sp:ssl// :8883	BridgeportCT/Eastside/AF1CLS_5	Write	Auto
4 AF1DPHI_5	sp:ssl// :8883	BridgeportCT/Eastside/AF1DPHI_5	Write	Auto
5 AF1FLT_5	sp:ssl// :8883	BridgeportCT/Eastside/AF1FLT_5	Write	Auto
6 AF1OPN_5	sp:ssl// :8883	BridgeportCT/Eastside/AF1OPN_5	Write	Auto
7 AF1RUN_5	sp:ssl// :8883	BridgeportCT/Eastside/AF1RUN_5	Write	Auto
8 AF2CLS_5	sp:ssl// :8883	BridgeportCT/Eastside/AF2CLS_5	Write	Auto
9 AF2DPHI_5	sp:ssl// :8883	BridgeportCT/Eastside/AF2DPHI_5	Write	Auto
10 AF2FLT_5	sp:ssl// :8883	BridgeportCT/Eastside/AF2FLT_5	Write	Auto
11 AF2OPN_5	sp:ssl// :8883	BridgeportCT/Eastside/AF2OPN_5	Write	Auto

At the bottom of the interface, there are two panels:

- Watch:** A table showing the current value and quality of a tag. The tag 'RAW_SEWAGE_FLOW' has a value of 686 and a quality of GOOD.
- Output:** A log window showing messages from the MQTT write group. The messages indicate that historical data is being processed and saved to SI, and that there were errors in publishing to the topic [10/21/2023].

The status bar at the bottom shows 'Ready' and 'Engineering + Runtime CAP NUM SCRL X: 72, Y: 391'.

Edge Data Collection

Connecting AVEVA DataHub

- AVEVA Adapter for MQTT
- Connect to cloud-based MQTT broker
- Connect to AVEVA DataHub
- Map MQTT broker tags to AVEVA DataHub streams

AVEVA™ Data Hub ▸ Edge Data Store & Adapters

BridgeportMQTT
AVEVA Adapter for MQTT 1.2.0.59

Details Configuration

JSON Configuration ▾

```
"DataSource": {  
  "hostnameOrIpAddress": "  
  "port": 8883,  
  "PrimaryHostID": "Bridgeport-DataHub",  
  "protocol": "Tcp",  
  "TLS": "Tls12",  
  "userName": "  
  "password": "{{DataSourceSecret}}",  
  "clientId": "  
  "MQTTVersion": "3.1.1",  
  "validateServerCertificate": false,  
  "streamIdPrefix": null,  
  "defaultStreamIdPattern": "{MetricName}"  
}
```

```
"DataSource": {  
  "hostnameOrIpAddress": "  
  "port": 8883,  
  "PrimaryHostID": "Bridgeport-DataHub",  
  "protocol": "Tcp",  
  "TLS": "Tls12",  
  "userName": "  
  "password": "{{DataSourceSecret}}",  
  "clientId": "  
  "MQTTVersion": "3.1.1",  
  "validateServerCertificate": false,  
  "streamIdPrefix": null,  
  "defaultStreamIdPattern": "{MetricName}"  
},  
"DataFilters": [  
  {  
    "id": "DuplicateData",  
    "absoluteDeadband": 0,  
    "percentChange": null,  
    "expirationPeriod": "1:00:00"  
  }  
],  
"DataSelection": [  
  {  
    "topic": "spBv1.0/BridgeportCT/NDATA/Eastside",  
    "metricName": "AIRFLWA_5"  
  },  
  {  
    "topic": "spBv1.0/BridgeportCT/NDATA/Eastside",  
    "metricName": "AIRFLWB_5"  
  },  
  {  
    "topic": "spBv1.0/BridgeportCT/NDATA/Eastside",
```

COLLAPSE < Items per page: 50 1 - 1 of 1 < >

Edge Data Collection

Connecting AVEVA DataHub

- AVEVA Adapter for MQTT
- Connect to cloud-based MQTT broker
- Connect to AVEVA DataHub
- Map MQTT broker tags to AVEVA DataHub streams

```
    "DataFilters": [
      {
        "id": "DuplicateData",
        "absoluteDeadband": 0,
        "percentChange": null,
        "expirationPeriod": "1:00:00"
      }
    ],
    "DataSelection": [
      {
        "topic": "spBv1.0/BridgeportCT/NDATA/Eastside",
        "metricName": "AIRFLWA_5"
      },
      {
        "topic": "spBv1.0/BridgeportCT/NDATA/Eastside",
        "metricName": "AIRFLWB_5"
      },
      {
        "topic": "spBv1.0/BridgeportCT/NDATA/Eastside",
        "metricName": "AIRFLWB_5"
      }
    ]
```

Edge Data Collection

Connecting AVEVA DataHub

- Deploy AVEVA DataHub device configuration
- Requirement to support variety of protocols
 - AVEVA Edge and AVEVA Adapter
- How to deal with software installation, updates and status

The screenshot displays the AVEVA Edge Management interface. On the left, a 'Device List' table shows a 'Bridgeport MQTT' device with a status of 'DEPLOYED', a connection icon, and a license checkmark. A modal window titled 'Bridgeport MQTT' is open, showing the 'Modules' tab. This modal contains a list of modules, including 'AVEVA Adapter for MQTT 1/mo'. To the right, a larger 'Bridgeport MQTT' configuration window is visible, showing the 'Modules' tab with a dropdown for 'Versions *' set to '1.2.0.59'. The configuration fields include: 'Deployment Name *' (adapter_mqtt_module), 'Configuration File *' (BridgeportMQTT 2023-08), 'Connection Port *' (5590), and 'Secret Store' (File Store). A 'Setup' button is at the bottom right of the configuration window. The main interface also shows a 'Back To Add Modules' link and a 'Cancel' button at the bottom right.

Edge Data Collection

Software Management

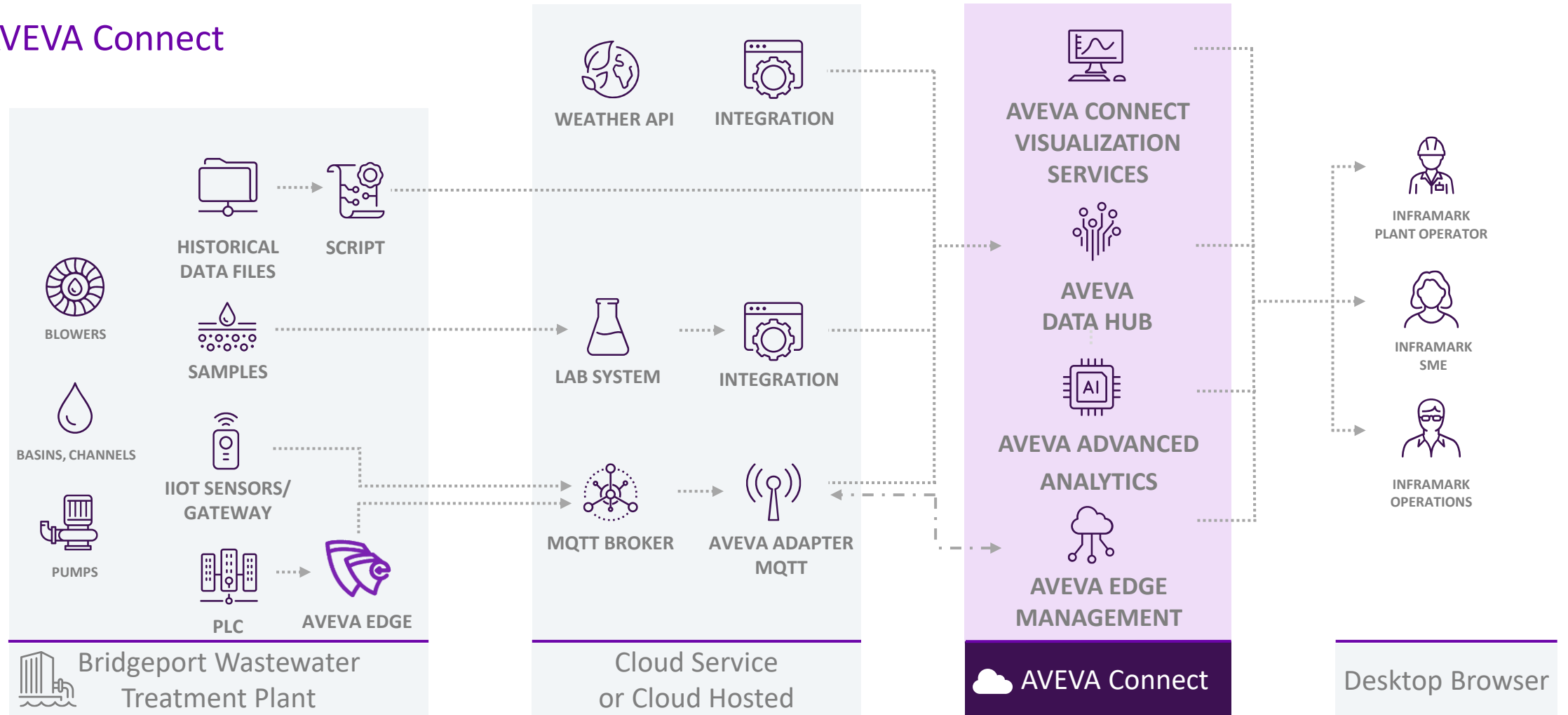
- Requirement to support variety of protocols
 - AVEVA Edge and AVEVA Adapter
- How to deal with software installation, configuration updates and status monitoring

The screenshot displays the AVEVA™ Edge Management interface. On the left, the 'Device List' table shows a single device named 'Bridgeport MQTT' with a status of 'DEPLOYED', a connection icon, and a license checkmark. A purple arrow points from the 'How to deal with software installation, configuration updates and status monitoring' bullet point to this device. On the right, the 'Bridgeport MQTT' configuration window is open, showing the 'Deployment' tab. A purple arrow points from the 'Deployment' tab to the 'Deployment Name' field, which contains 'adapter_mqtt_module'. Other fields include 'Configuration File' (BridgeportMQTT 2023-08), 'Connection Port' (5590), and 'Secret Store' (File Store). The 'Setup' button is visible at the bottom of the configuration window. The interface also shows a 'Back To Add Modules' link and a 'Versions' dropdown set to 1.2.0.59.

Aggregating the Data

Lighthouse Architecture

AVEVA Connect



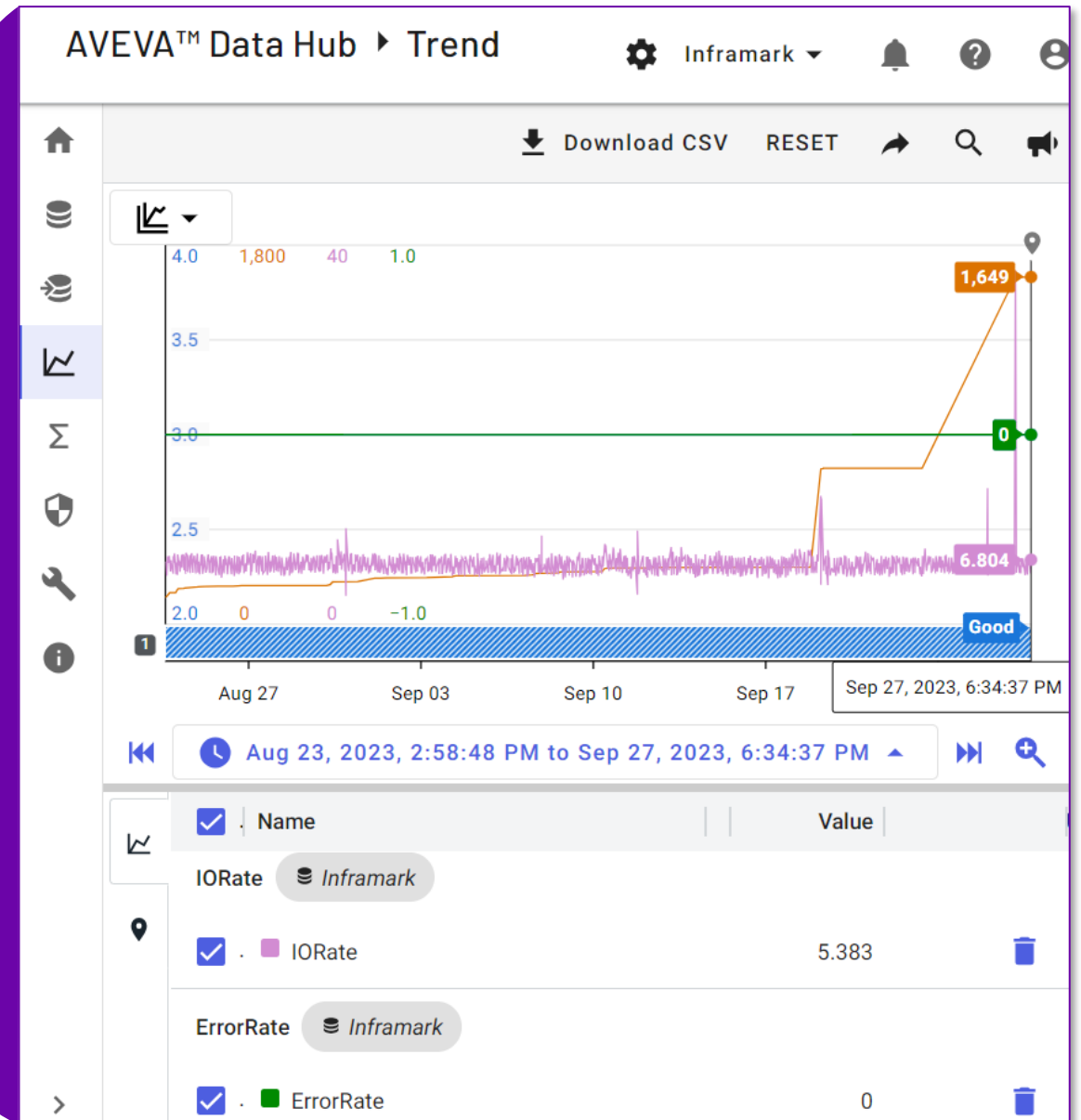
Edge Data Collection

Data Flow Management

- Keep the data flowing
 - Data Hub historizes metrics
 - Monitor health

✓ BridgeportCT.Eastside 

Health	Good
IO Rate	7.15 event/s
Error Rate	0 event/s
Type Count	3
Stream Count	1,649



Data Management

Creating assets from Data Hub

- BridgeportCT.Eastside.ASPRAS2_4
- BridgeportCT.Eastside.ASPRAS3_4
- BridgeportCT.Eastside.ASPRAS4_4
- BridgeportCT.Eastside.ASPRAS5_4
- BridgeportCT.Eastside.ASPRAS6_4
- BridgeportCT.Eastside.NUMRASP_4
- BridgeportCT.Eastside.RAS1_OK_4

Stream Name

BridgeportCT.Eastside.ASPRAS1_4

1. Match letters preceding the delimiter "." {customer} - BridgeportCT
2. Match the delimiter "."
3. Match letters preceding the delimiter "." {siteName} - Eastside
4. Match the delimiter "."
5. Match the next 3 characters of any type (including letters, numbers, and symbols) {measurement} - ASP
6. Match the string literal "RAS"
7. Match the next group of numbers {equipmentNumber} - 1
8. Match characters of any type (including letters, numbers, and symbols) until the end of the stream name {token4} - _4

Stream Name

BridgeportCT.Eastside.RAS1_OK_4

1. Match letters preceding the delimiter "." {customer} - BridgeportCT
2. Match the delimiter "."
3. Match letters preceding the delimiter "." {siteName} - Eastside
4. Match the delimiter "."
5. Match the string literal "RAS"
6. Match the next group of numbers {equipmentNumber} - 1
7. Match characters of any type (including letters, numbers, and symbols) until the end of the stream name {measurement} - _OK_4

Undo Capture

Capture

Assets Search for Assets 🔍 + Add Asset ➡️ ⋮

🔼 RAS 🔄 🏠 ☰

Filter facets

processArea ^

- RAS
- Plant Influent
- WAS
- AB#3
- AB#4
- AB#5
- AB#1
- Primary Clarifiers
- Primary Effluent
- Effluent

Clear All Show More

siteName ∨

dataSource ∨

plcName ∨

Asset

- BridgeportCT.Eastside.RAS.Flows
- BridgeportCT.Eastside.RAS.P1
- BridgeportCT.Eastside.RAS.P2
- BridgeportCT.Eastside.RAS.P3
- BridgeportCT.Eastside.RAS.P4
- BridgeportCT.Eastside.RAS.P5
- BridgeportCT.Eastside.RAS.P6
- BridgeportCT.Eastside.RAS.Pumps12
- BridgeportCT.Eastside.RAS.Pumps34
- BridgeportCT.Eastside.RAS.Pumps56

1 - 10 of 10 ⏪ ⏩

Items per page: 50

BridgeportCT.Eastside.RAS.P6

RAS Pump 6 ✎ ⋮ ✕ Asset Type: <None>

Metadata Properties Status

Property	Last Value	UOM	Timestamp
non status value	true		9/29/23, 9:54 PM
<input checked="" type="checkbox"/> Speed Value	49.160		9/29/23, 9:54 PM
SSP_4 Value	true		8/17/23, 12:10 PM
SST_4 Value	true		8/17/23, 12:10 PM
Seal Water Fail Value	false		8/17/23, 12:10 PM
Motor High Temperature Value	false		8/17/23, 12:10 PM

Speed | Value Manual Speed Setpoint | Value

49.20 101.0

49.05 99.0

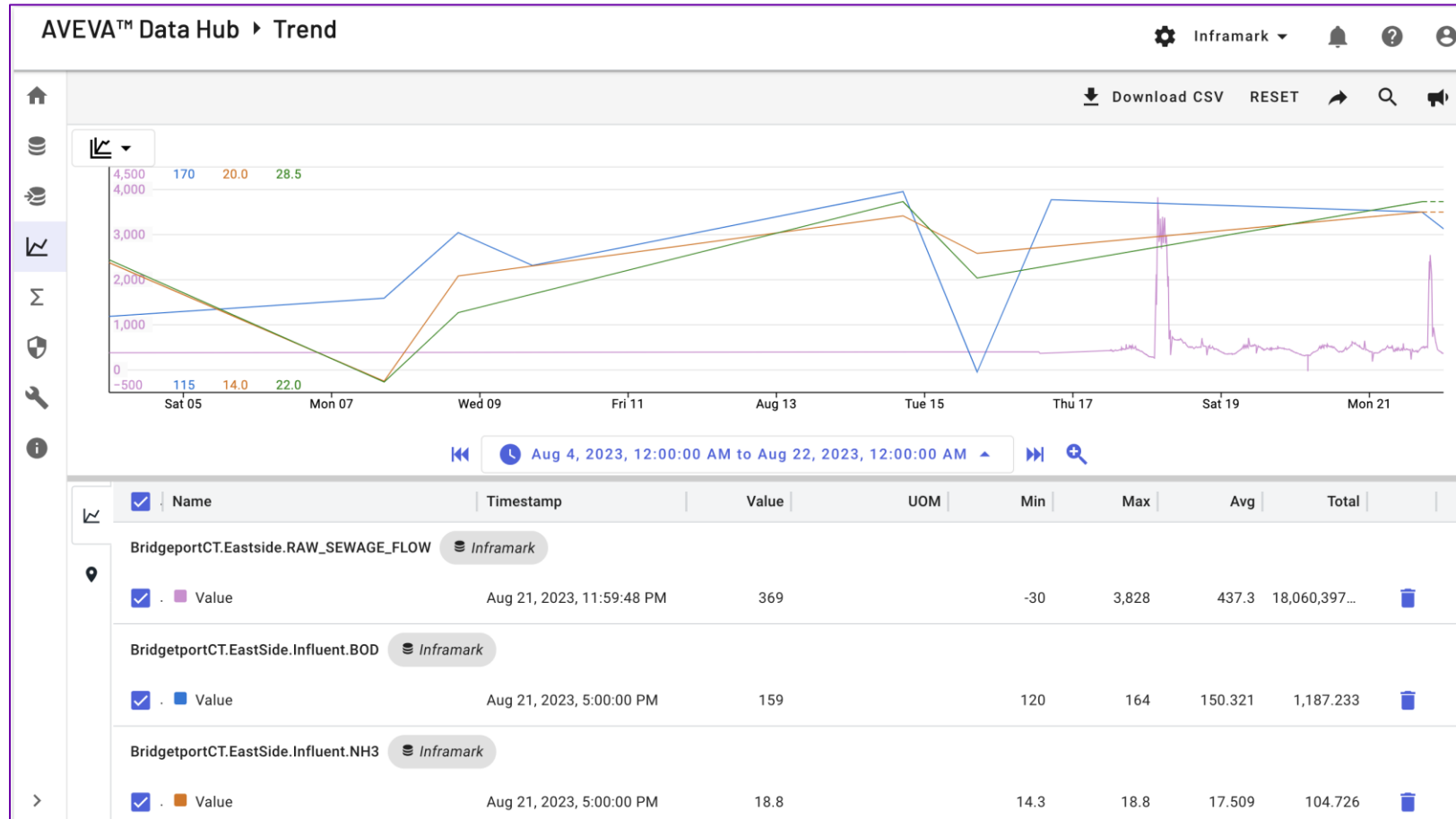
09 PM 09:15 09:30 09:45 Now

⏪ 🕒 Last 1 hour ⏩ 🔍 📄

Visualizing the Data

Understand the Dataset

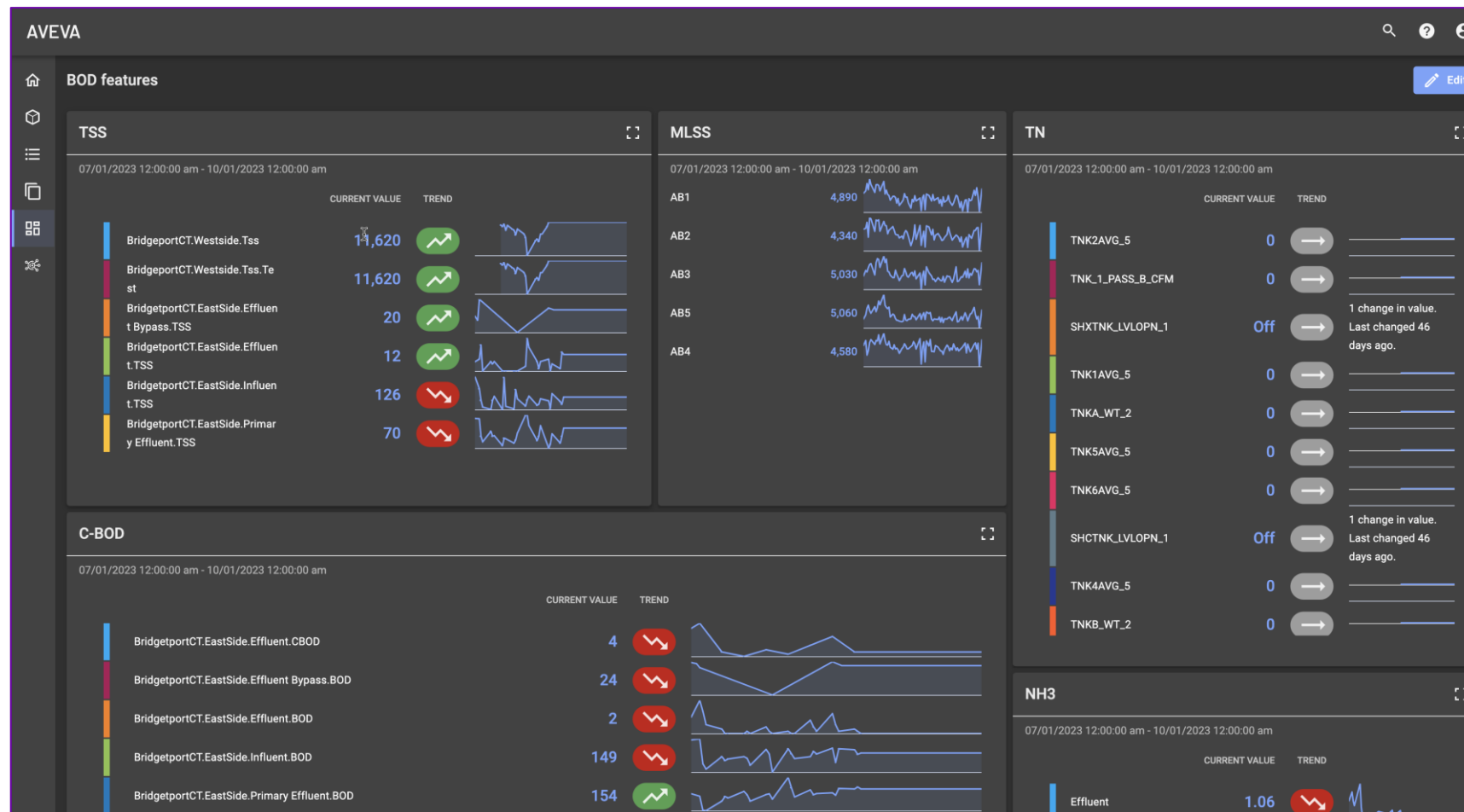
Viewing Stream Data



Assets, Content, & Dashboards

Visualization Content

- Create standalone visualization content
- Link content to Assets and Asset Types
- Create dashboards containing embedded and linked visualization content



Predicting the Data

Ideal Model Conditions

Overview

Name
TKN

Description
Predict quality parameter based on process data

Problem To Solve
Predict Quality

What data does this model use? 35 TOPICS

BridgetportCT.EastSide.Influent.NH3... Property Input Active

Actual Quality Property Input Active

Product Event Event Inactive

Active?: Last Training: **Oct 7th, 2023 at 16:37** Data collected every: **24:00** Executes every: **N/A** Retraining every: **N/A**

What data should the Model consider?

Add Data

1 Complete

When should data be collected?

Set Timing

2 Complete

Validate the Model's configuration.

Evaluate Model

3 Completed

Start training a Model with your Twin's data.

Start Training

4 Complete

See what your Model found in your data.

Review Results

5 Ready

Ideal Model Conditions

EffluentBOD Properties Search Properties...

Disabled properties below have already been used in this model.

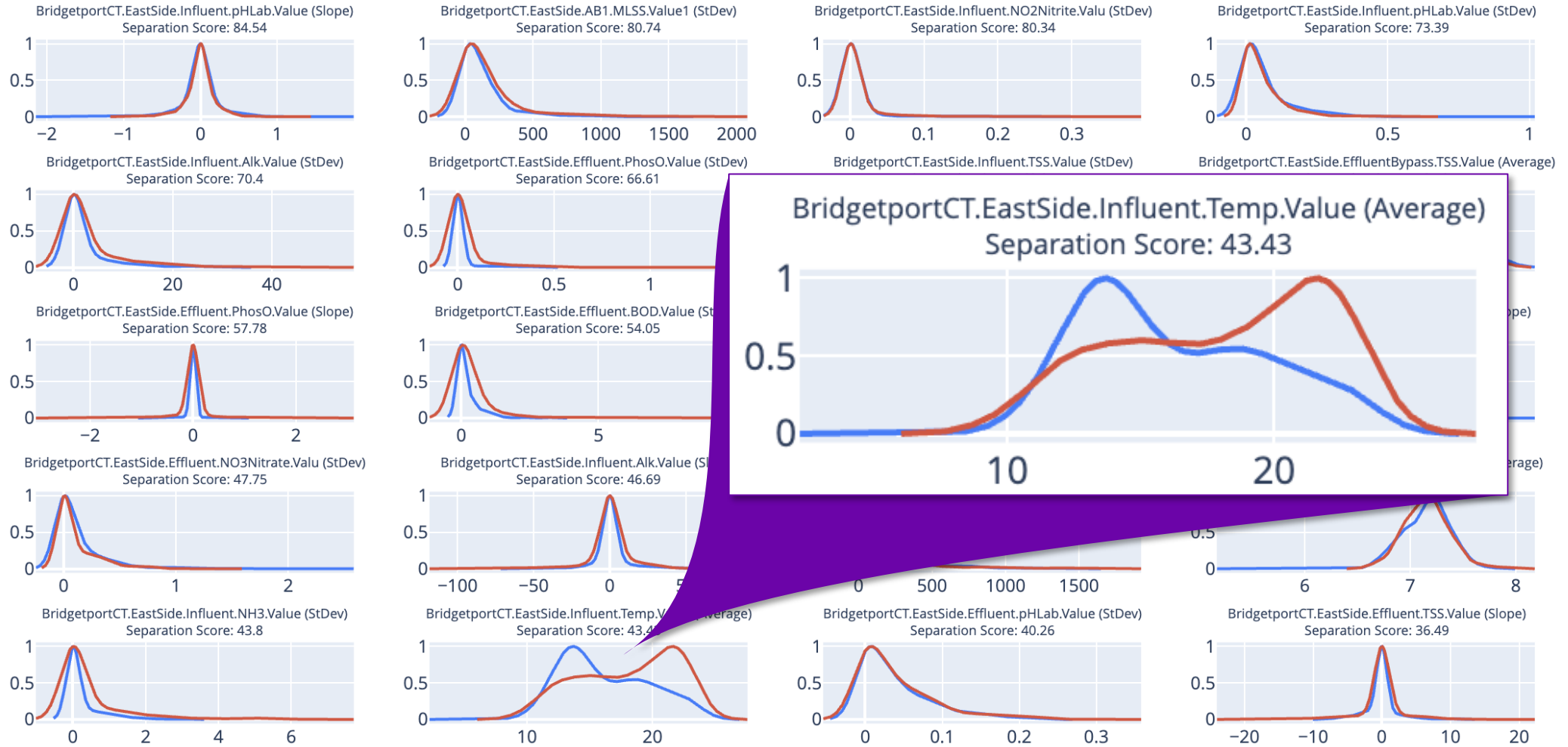
- BridgeportCT.Eastside.AB.DO_SP.Va 2.0
- BridgeportCT.Eastside.BYPDNSTROI True
- BridgeportCT.Eastside.BYPFLOW_3 0.1
- BridgeportCT.Eastside.BYPH2S1OPI True
- BridgeportCT.Eastside.BYPH2S2OPI True
- BridgeportCT.Eastside.BYPMETH1O True

TKN

Predict quality parameter based on process data

- Property to Predict** 💡 NEXT
 - * Predicting: Primary Effluent.TKN.Value Is Sample? 📄 🔗
- Property Inputs** #
- Set Controllables** #
- Segmentation** 🔗
- Filtering** ⌵
- Targets and Limits** 🕒
- Model Outputs** 📄

Separation Analysis

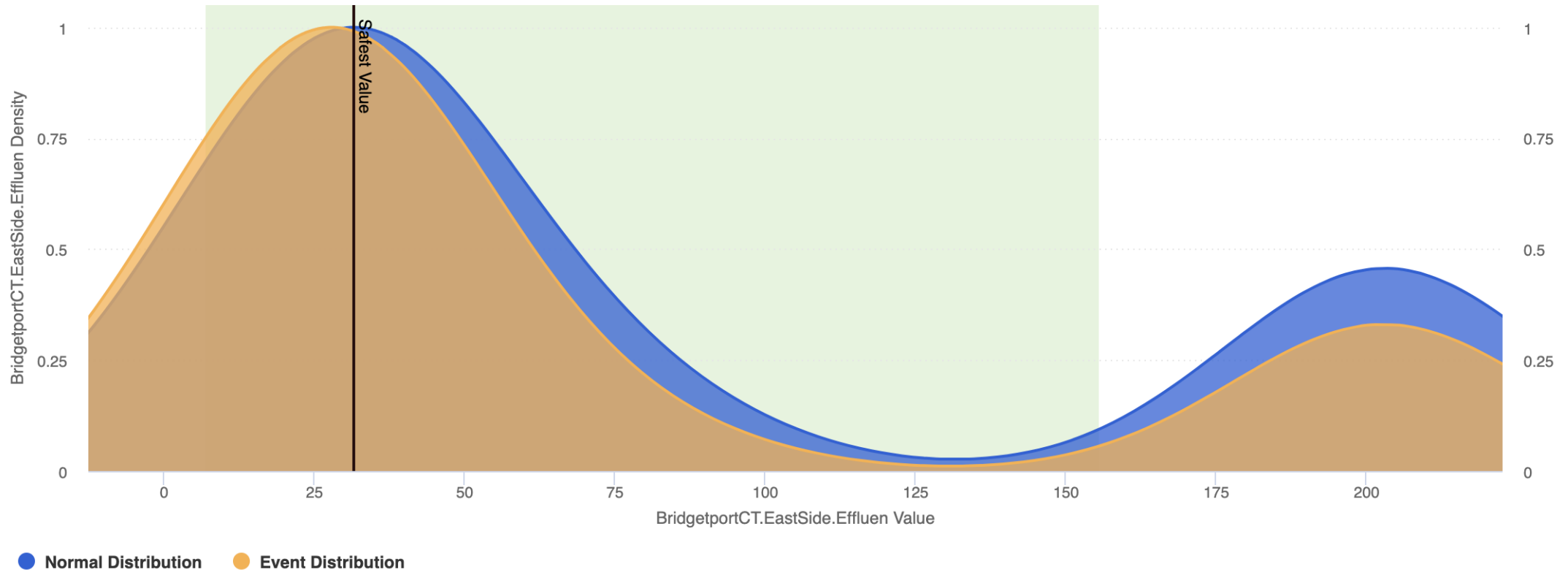


Ideal Model Conditions

☆ BridgetportCT.EastSide.Effluent Bypass.TSS.Value

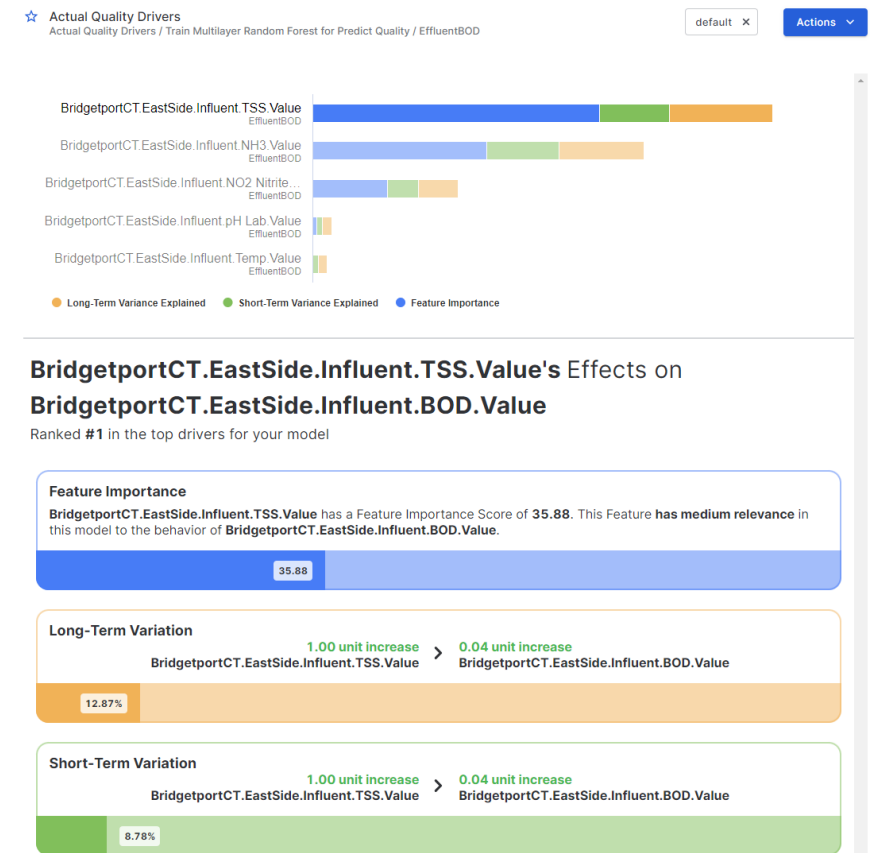
default ×

Actions ▾



Predict Biological Oxygen Demand

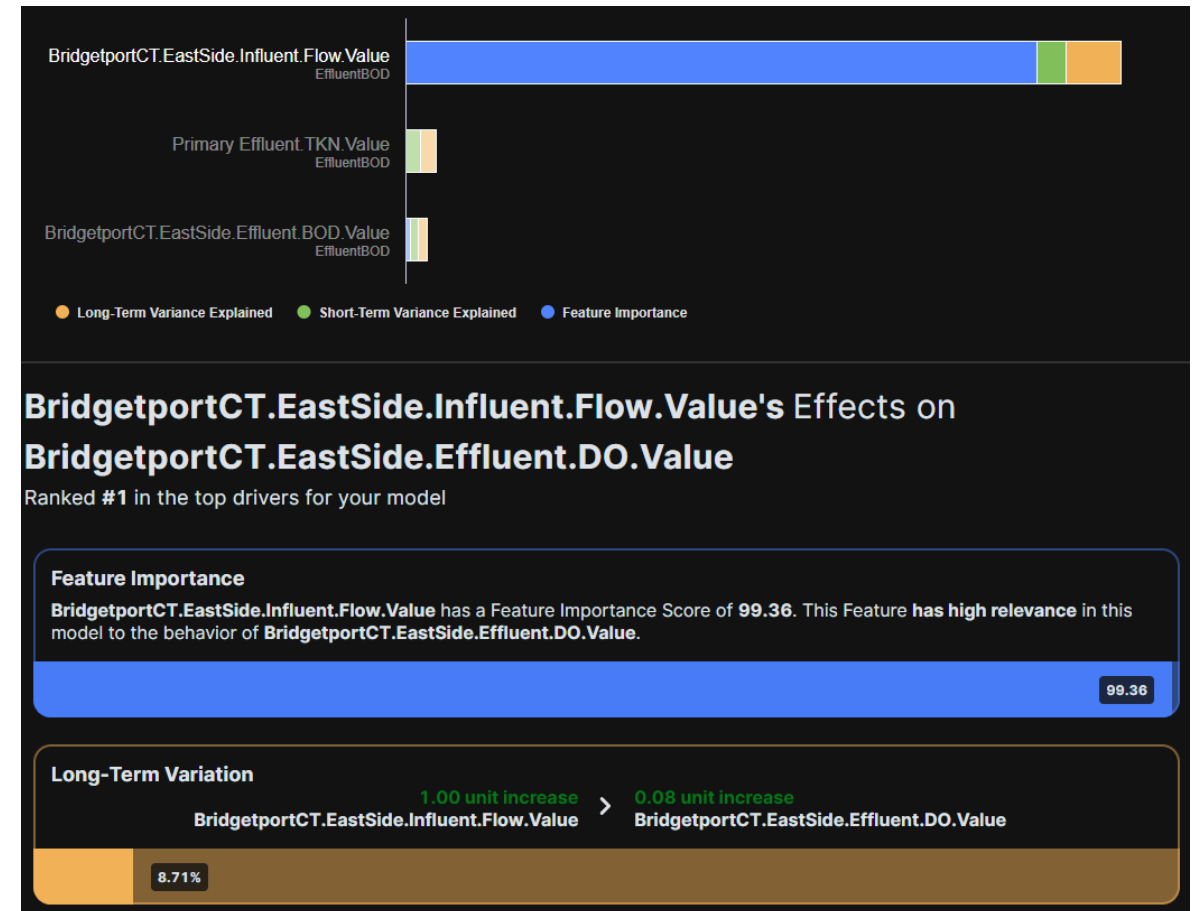
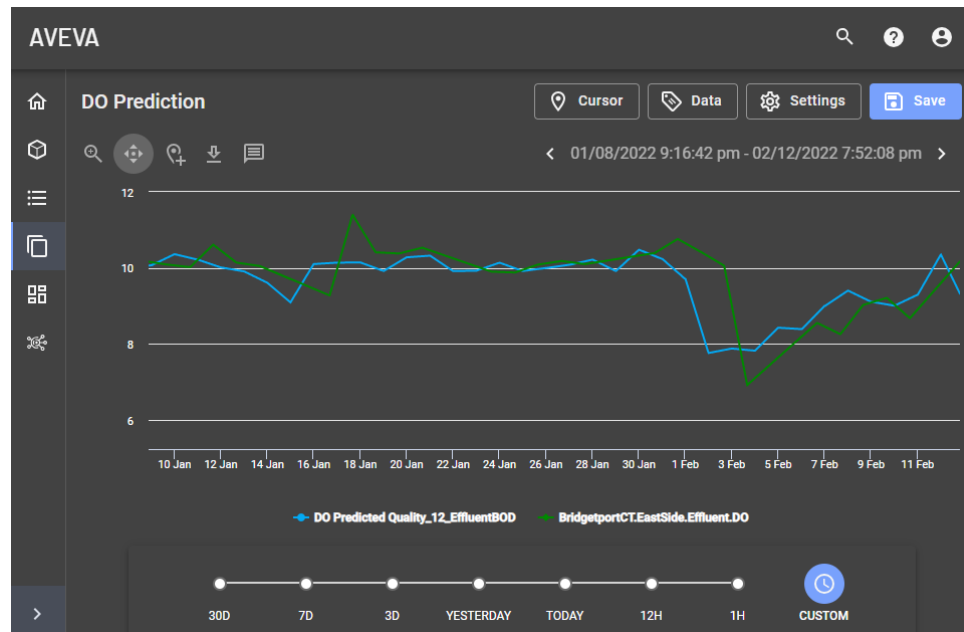
- Required for Dissolved Oxygen prediction
- 5+ day advantage over lab results



Predict Dissolved Oxygen

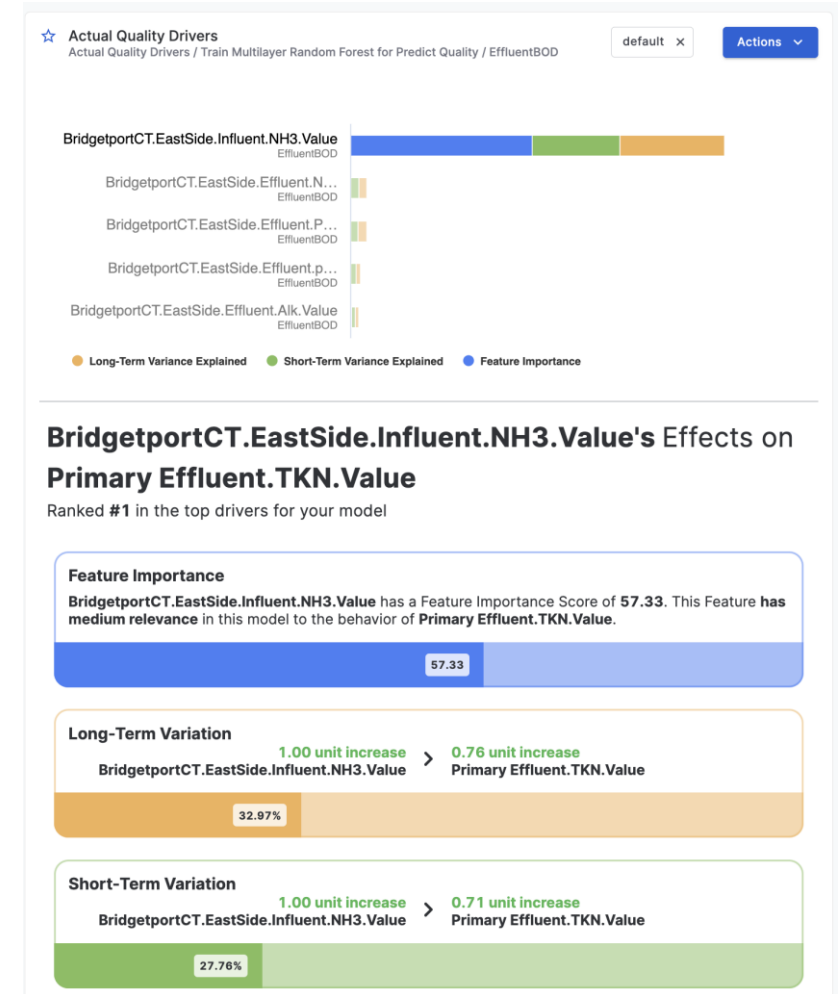
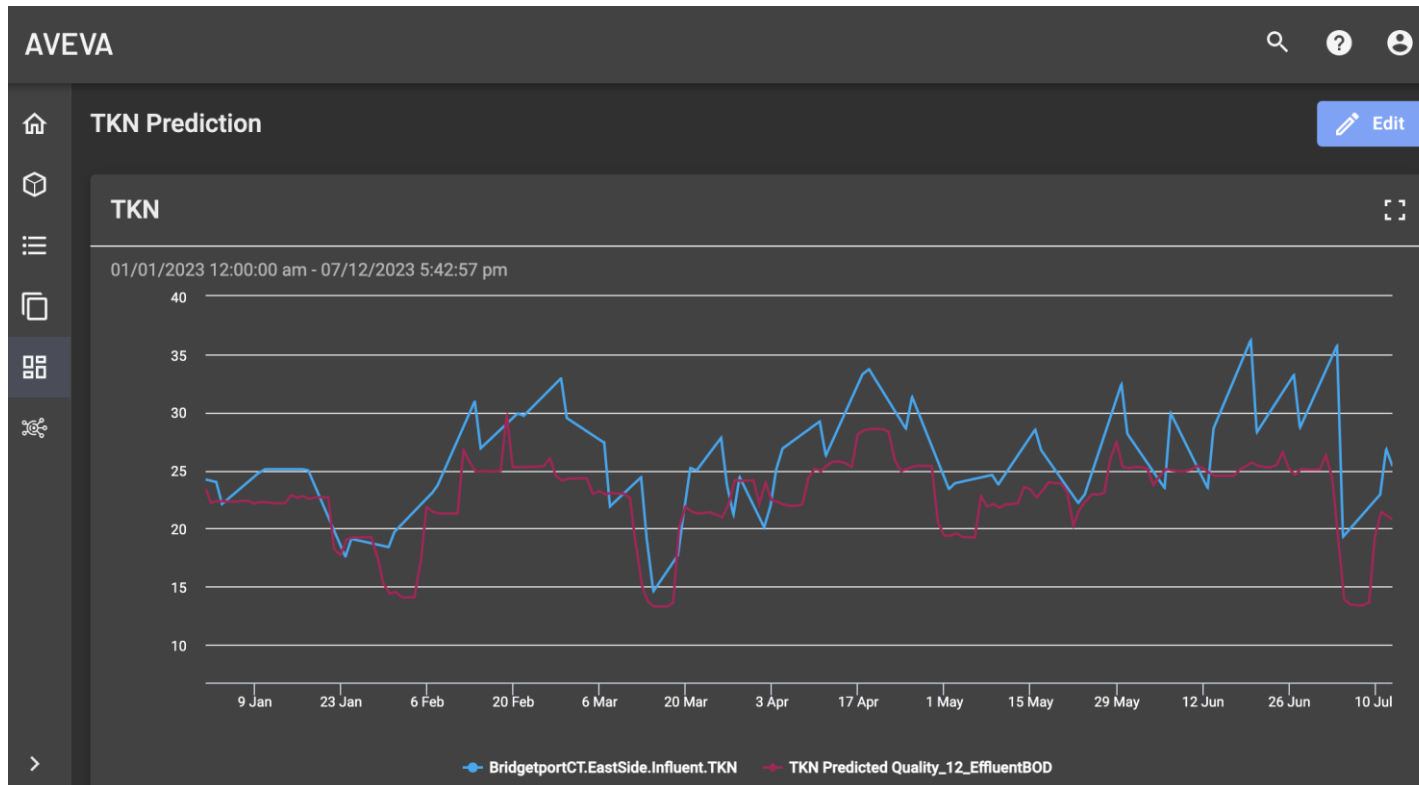
Dissolved Oxygen Predictions

- Exploring dataset for modeling opportunities
- Predictions could help reduce energy use



Predict Total Kjeldahl Nitrogen (TKN)

- Required to make other biological process predictions

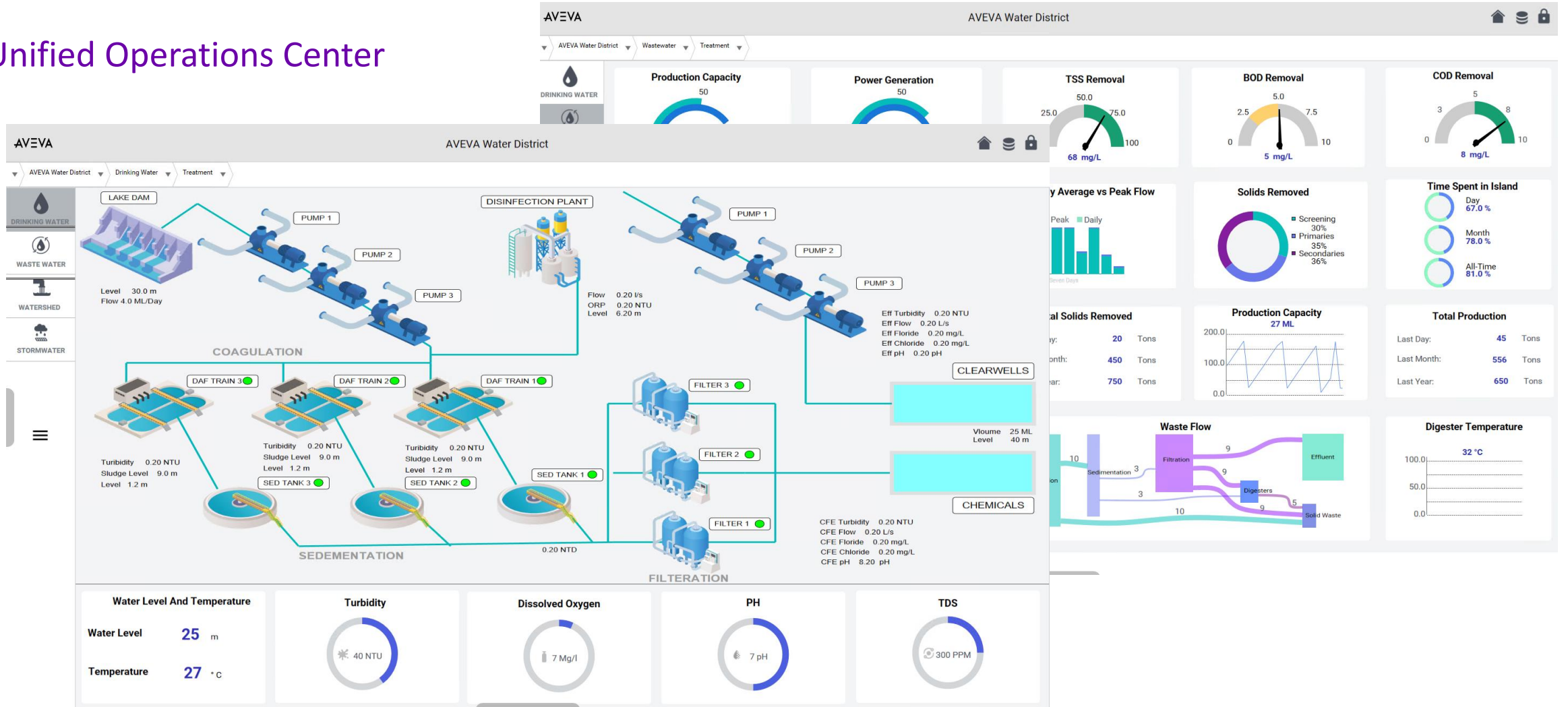


Next Steps

- Add additional instrumentation
- Utilize AVEVA Advanced Analytics' controllable inputs and limits
- Generate process control suggestions from AVEVA Advanced Analytics models
- Finalize AVEVA Connect Visualization content showing inputs, predictions, and suggestions
- Incorporate AVEVA Advanced Analytics data into on-premise or cloud SCADA platforms

Looking to the Future

Unified Operations Center





Eric Conder

HMI Department Manager

- Inframark A&I Division
- eric.conder@inframark.com

Questions?

Please wait for the microphone.
State your name and company.



Please remember to...

Navigate to this session in the mobile app to complete the survey.



Thank you!

Recommended Sessions

Secure data sharing at scale with the AVEVA Data Hub Community

Tuesday, October 24 @ 2:50pm
Room 2004

Unlocking the power of AIOps for IIoT with AVEVA Data Hub and AVEVA Advanced Analytics

Accenture

Tuesday, October 24 @ 3:50pm
Room 2004

Introduction to AVEVA's Developer Program

Tuesday, October 24 @ 4:30pm
Room 2004

Enabling end-to-end continuous biomanufacturing by leveraging real-time data in the cloud

Biosana

Wednesday, October 25 @ 8:40am
Room 2004

Uniting AVEVA Data Hub and Advanced Analytics with IOTA View, for Proactive Well Maintenance

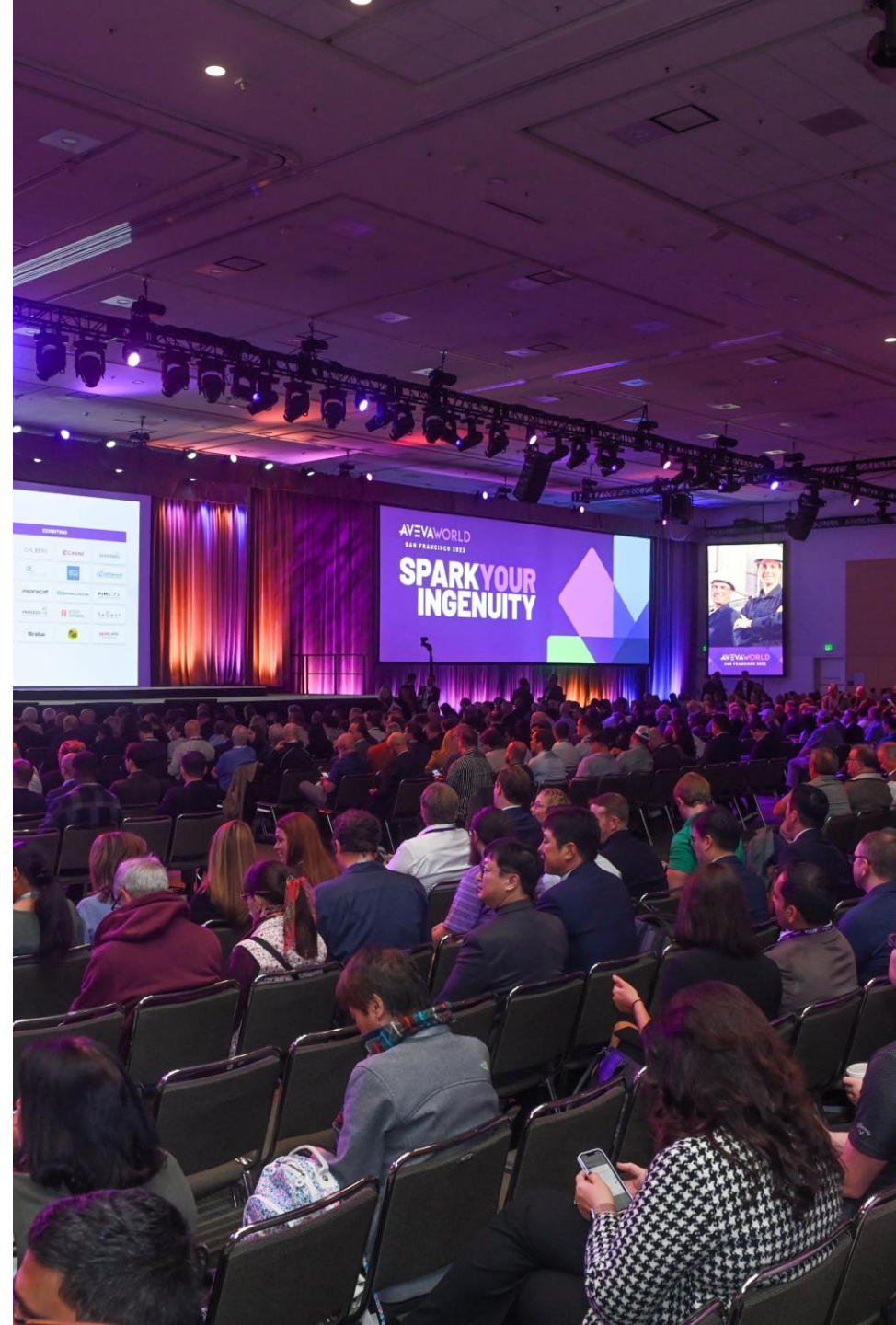
Devon Energy

Wednesday, October 25 @ 10:20am
Room 2004

Sharing data across Quebec Iron Ore's IT and OT ecosystem with AVEVA's cloud technologies

Quebec Iron Ore

Wednesday, October 25 @ 1:30pm
Room 2004



This presentation may include predictions, estimates, intentions, beliefs and other statements that are or may be construed as being forward-looking. While these forward-looking statements represent our current judgment on what the future holds, they are subject to risks and uncertainties that could result in actual outcomes differing materially from those projected in these statements. No statement contained herein constitutes a commitment by AVEVA to perform any particular action or to deliver any particular product or product features. Readers are cautioned not to place undue reliance on these forward-looking statements, which reflect our opinions only as of the date of this presentation.

The Company shall not be obliged to disclose any revision to these forward-looking statements to reflect events or circumstances occurring after the date on which they are made or to reflect the occurrence of future events.

 [linkedin.com/company/aveva](https://www.linkedin.com/company/aveva)

 [@avevagroup](https://twitter.com/avevagroup)

ABOUT AVEVA

AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

Learn more at www.aveva.com