Natel Energy

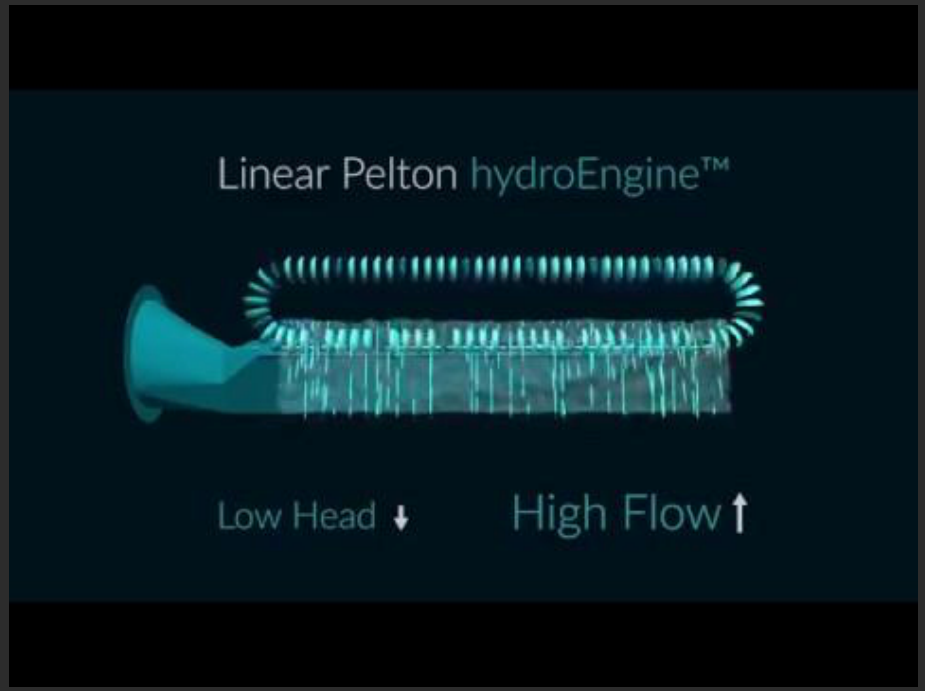
Ryan McKinley

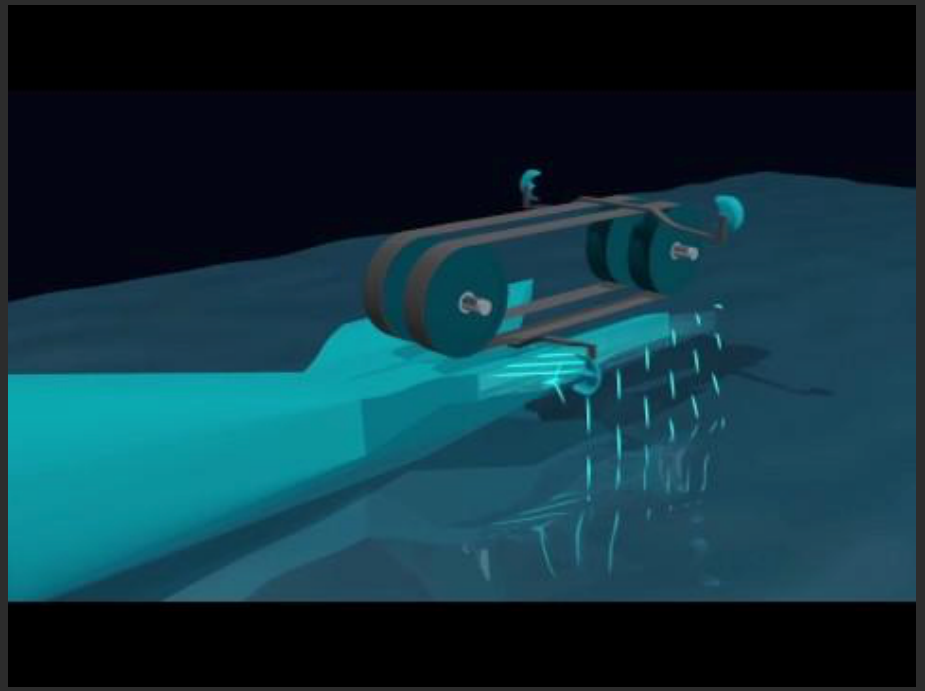
Previously:

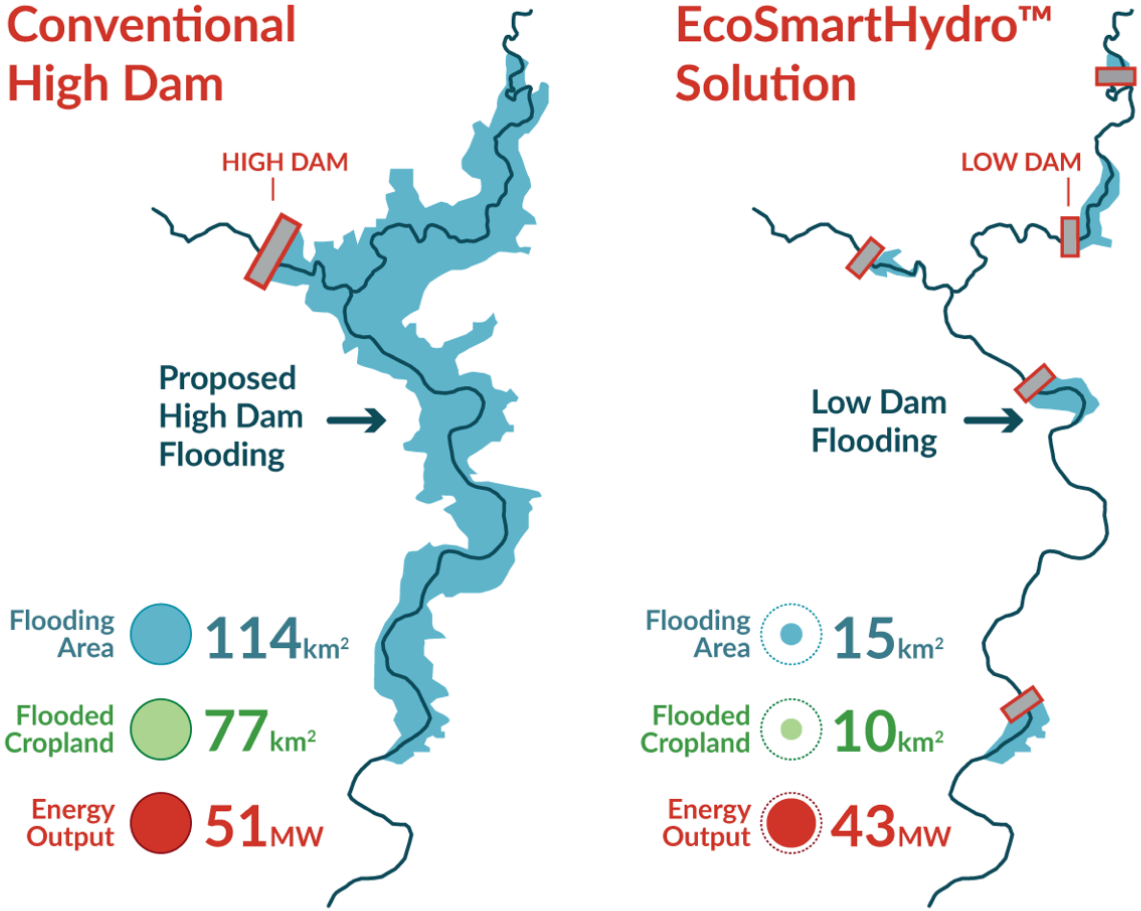
VoyagerSearch.com

Apache Lucene/Solr

Instructables.com


Linear Pelton hydroEngine™
Low Head
High Flow




Conventional
High Dam
HIGH DAM
Proposed
High Dam
Flooding
Flooding
Area
114km²
Flooded
Cropland
77 km²
Energy
Output
51MW
EcoSmartHydro™
Solution
LOW DAM
Low Dam
Flooding
Flooding
Area
15km²
Flooded
Cropland
10km²
Energy
Output
43MW

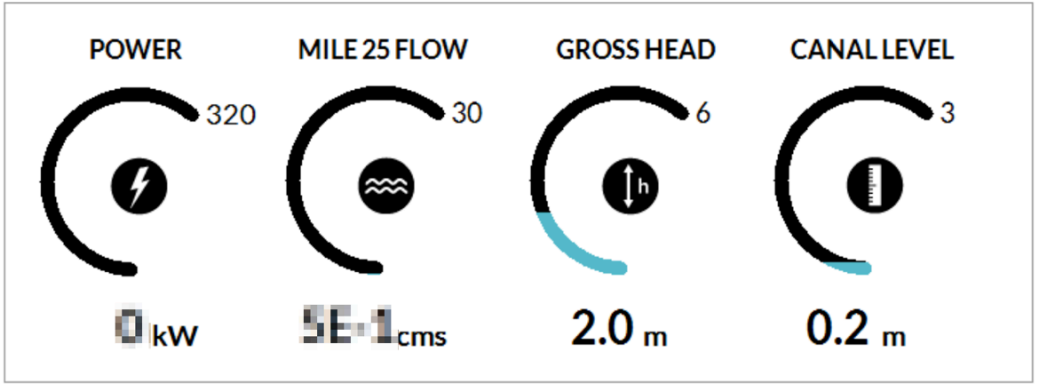
SYSTEM STATUS

[redacted]

OPERATOR PERMISSIVE

PAUSE

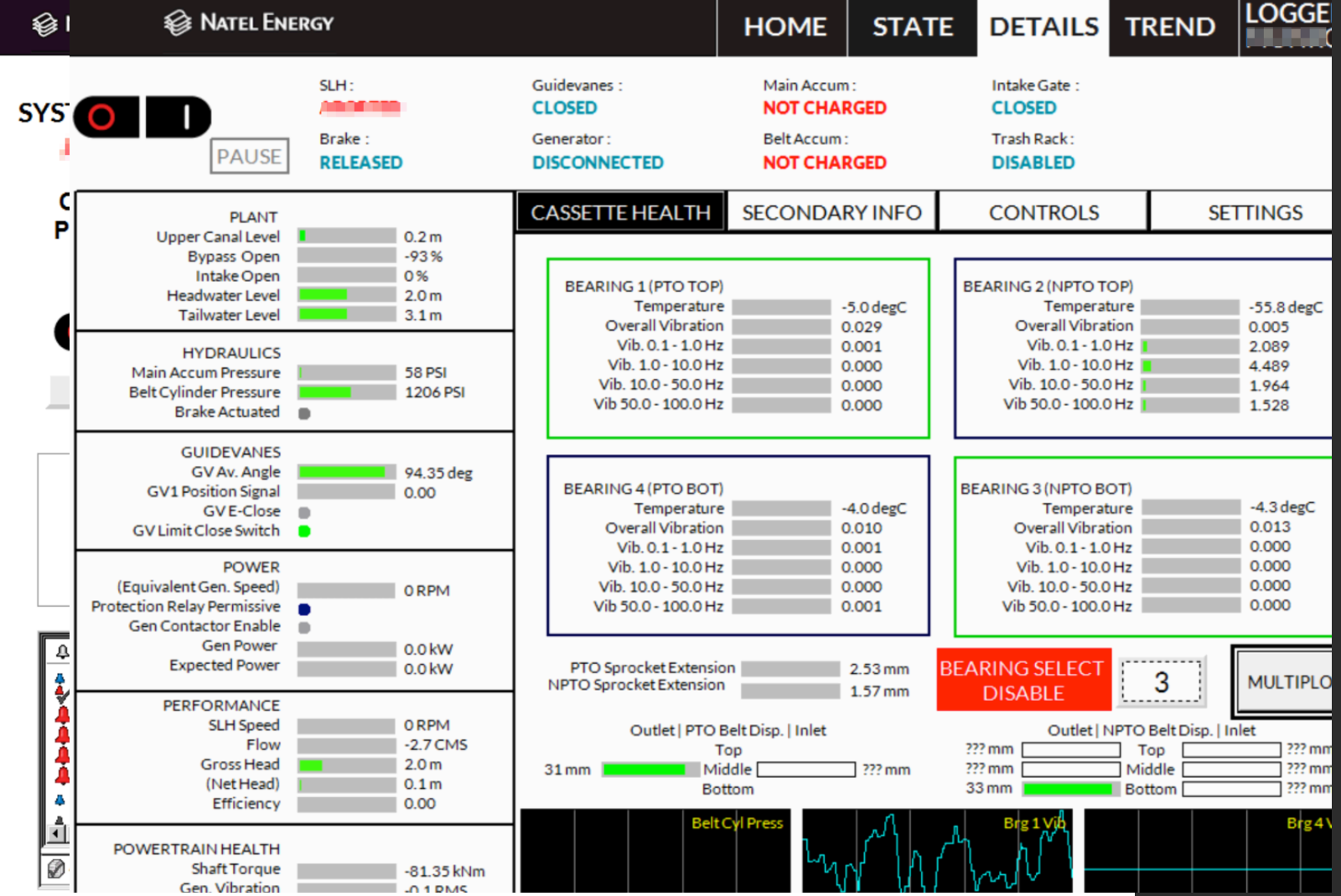
E-STOP



SLH100	INTAKE GATE	TRASH RACK	Guide vanes	Belt Tensioner	GENERATOR
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Alarm State	Event Time	Alarm Name		Limit..	Message
Normal, Unacked	10/12/2017 8:05:30 PM	...e_Monitoring.SLH_Blade_Trans8Alarm_Abort	HIHI	5	
In Alarm, Acked	10/13/2017 5:04:30 PM	...rogram:SLH_1_Control.Button_Estop_ALARM	TRIP		The emergency stop button has been engaged by an
In Alarm, Unacked	10/14/2017 11:44:18 AM	...ram:Plant_Control.Fluid_Level_Canal_ALARM	LO	1.92	Upper canal below typical level : Water Level decreas
In Alarm, Unacked	10/14/2017 11:45:52 AM	...ram:Plant_Control.Fluid_Level_Canal_ALARM	LOLO	1.85	Upper canal excessively drained : Water Level decrea
In Alarm, Unacked	10/14/2017 11:49:18 AM	...]Program:Plant_Control.Gate_Bypass_ALARM	TRIP		Bypass gate is unable to maintain the canal level within
In Alarm, Unacked	10/14/2017 11:54:33 AM	...t_Control.Fluid_Level_Canal_Critical_ALARM	LOLO	1.7	Upper Canal Level Critically Low: Water Level decreas
Normal, Unacked	10/25/2017 5:17:54 AM	...rogram:SLH_1_Control.SLH_Brg_Vib_ALARM	HIHI	2	One or more SLH bearings have extremely high vibratio
Normal, Unacked	10/25/2017 5:17:54 AM	...rogram:SLH_1_Control.SLH_Brg_Vib_ALARM	HI	1	One or more SLH bearings have slightly elevated vibra

Ack All | Ack Selected | Disable Selected | View Selected Alarm Details | Refresh | Alarm Status Explorer


NATEL ENERGY
HOME
STATE
DETAILS
TREND
LOGGE
SYS
PAUSE
SLH :
Guidevanes :
CLOSED
Main Accum :
NOT CHARGED
Intake Gate :
CLOSED
Brake :
RELEASED
Generator :
DISCONNECTED
Belt Accum :
NOT CHARGED
Trash Rack :
DISABLED
PLANT
Upper Canal Level 0.2 m
Bypass Open -93 %
Intake Open 0 %
Headwater Level 2.0 m
Tailwater Level 3.1 m
HYDRAULICS
Main Accum Pressure 58 PSI
Belt Cylinder Pressure 1206 PSI
Brake Actuated
GUIDEVANES
GV Av. Angle 94.35 deg
GV1 Position Signal 0.00
GV E-Close
GV Limit Close Switch
POWER
(Equivalent Gen. Speed) 0 RPM
Protection Relay Permissive
Gen Contactor Enable
Gen Power 0.0 kW
Expected Power 0.0 kW
PERFORMANCE
SLH Speed 0 RPM
Flow -2.7 CMS
Gross Head 2.0 m
(Net Head) 0.1 m
Efficiency 0.00
POWERTRAIN HEALTH
Shaft Torque -81.35 kNm
Gen. Vibration
CASSETTE HEALTH
SECONDARY INFO
CONTROLS
SETTINGS
BEARING 1 (PTO TOP)
Temperature -5.0 degC
Overall Vibration 0.029
Vib. 0.1 - 1.0 Hz 0.001
Vib. 1.0 - 10.0 Hz 0.000
Vib. 10.0 - 50.0 Hz 0.000
Vib 50.0 - 100.0 Hz 0.000
BEARING 2 (NPTO TOP)
Temperature -55.8 degC
Overall Vibration 0.005
Vib. 0.1 - 1.0 Hz 2.089
Vib. 1.0 - 10.0 Hz 4.489
Vib. 10.0 - 50.0 Hz 1.964
Vib 50.0 - 100.0 Hz 1.528
BEARING 4 (PTO BOT)
Temperature -4.0 degC
Overall Vibration 0.010
Vib. 0.1 - 1.0 Hz 0.001
Vib. 1.0 - 10.0 Hz 0.000
Vib. 10.0 - 50.0 Hz 0.000
Vib 50.0 - 100.0 Hz 0.001
BEARING 3 (NPTO BOT)
Temperature -4.3 degC
Overall Vibration 0.013
Vib. 0.1 - 1.0 Hz 0.000
Vib. 1.0 - 10.0 Hz 0.000
Vib. 10.0 - 50.0 Hz 0.000
Vib 50.0 - 100.0 Hz 0.000
PTO Sprocket Extension 2.53 mm
NPTO Sprocket Extension 1.57 mm
BEARING SELECT DISABLE
3
MULTIPLO
Outlet | PTO Belt Disp. | Inlet
Top
31 mm Middle ??? mm
Bottom
Outlet | NPTO Belt Disp. | Inlet
??? mm Top ??? mm
??? mm Middle ??? mm
33 mm Bottom ??? mm
Belt Cyl Press
Brg 1 Vib
Brg 4 V

NATEL ENERGY

HOME | STATE | DETAILS | TREND | LOGGED

HPU

Accum. Press. | Pump Vibration

Intake Gate

Position

Clear All

Hide Selection

Start Time: 2 / 14 / 14 — 0 : 0 : 0

Time Span: 0 Days 0 Hour — 5 Minutes

Plant

Bypass Flow | Canal Level | PowerHouse Temp | Headwater Level

Gross Head | Tailwater Level | Bypass Crest

SLH

Flow | Speed | Penstock Pressure | Bearing1 Vib. (Main) | Bearing2 Vibration | SLH Fault

Draft Tube Pressure | Outlet Pressure | Brake | Bearing1 Temp (Main) | Bearing2 Temp | Oil Moisture

Net Head | Efficiency | Gen Contactor | Bearing3 Vibration | Bearing4 Vibration

Inlet Pressure | Torque | Gen Relay | Bearing3 Temp | Bearing4 Temp

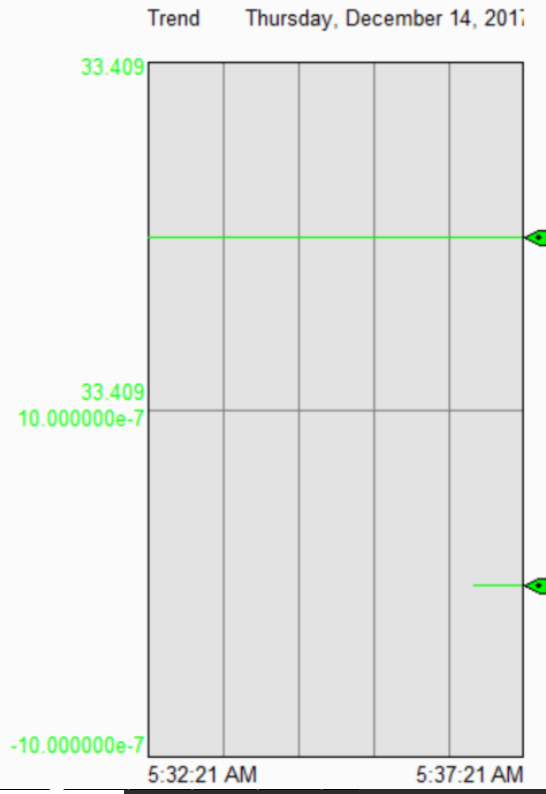
Generator

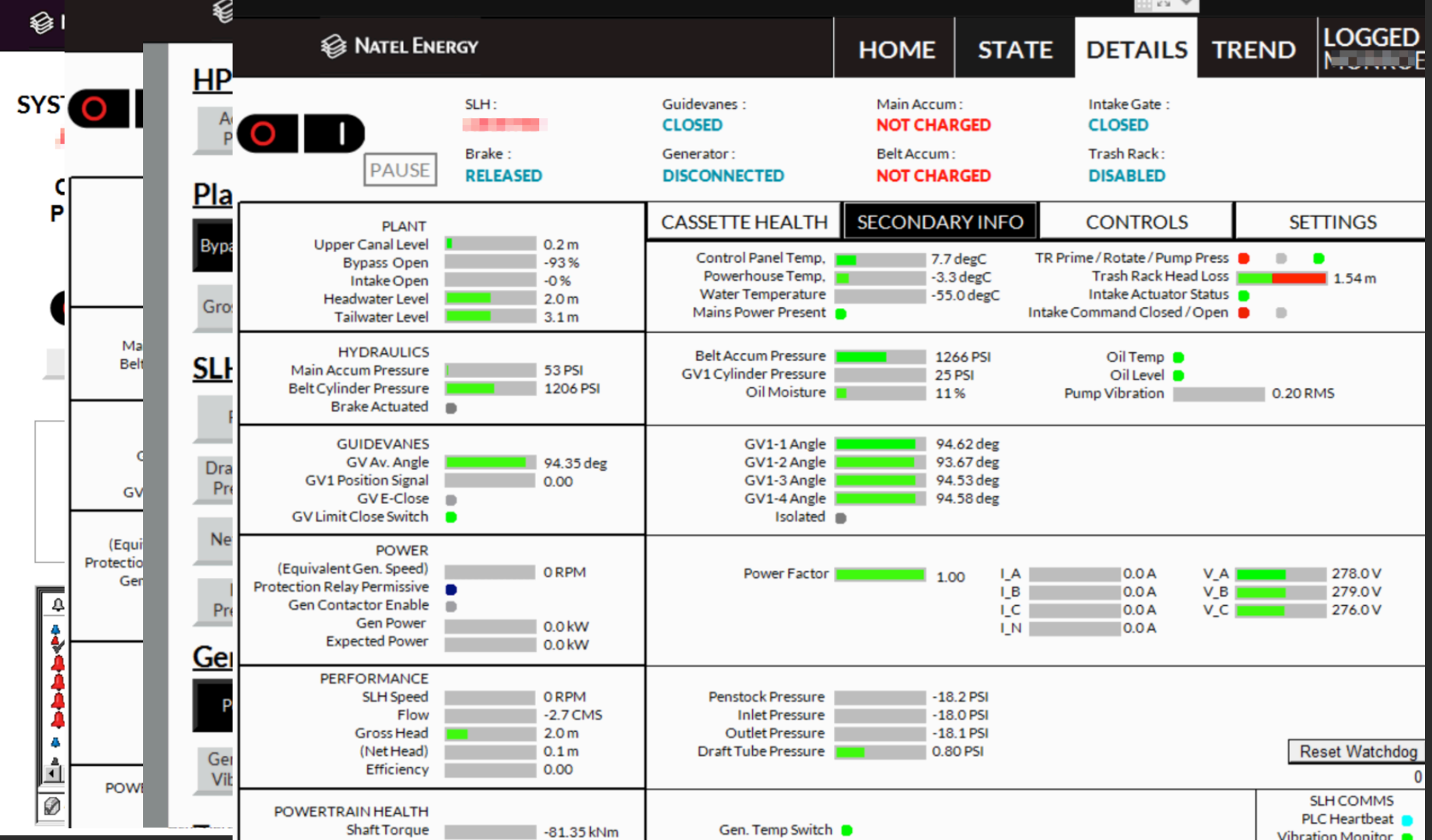
Power | Speed | Gearbox Vibration

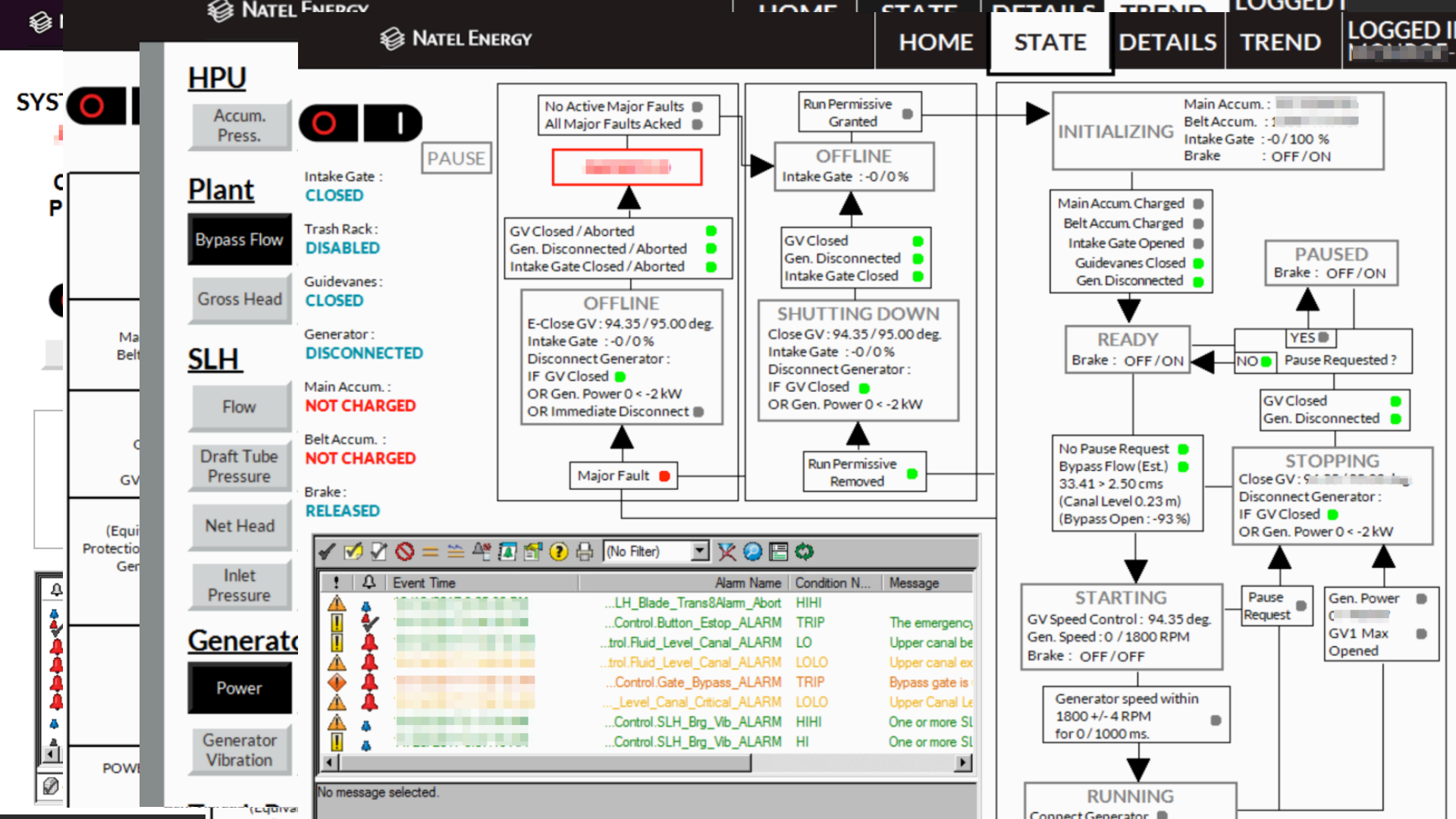
Generator Vibration | Gearbox Temp. | Power Factor

Guidevanes

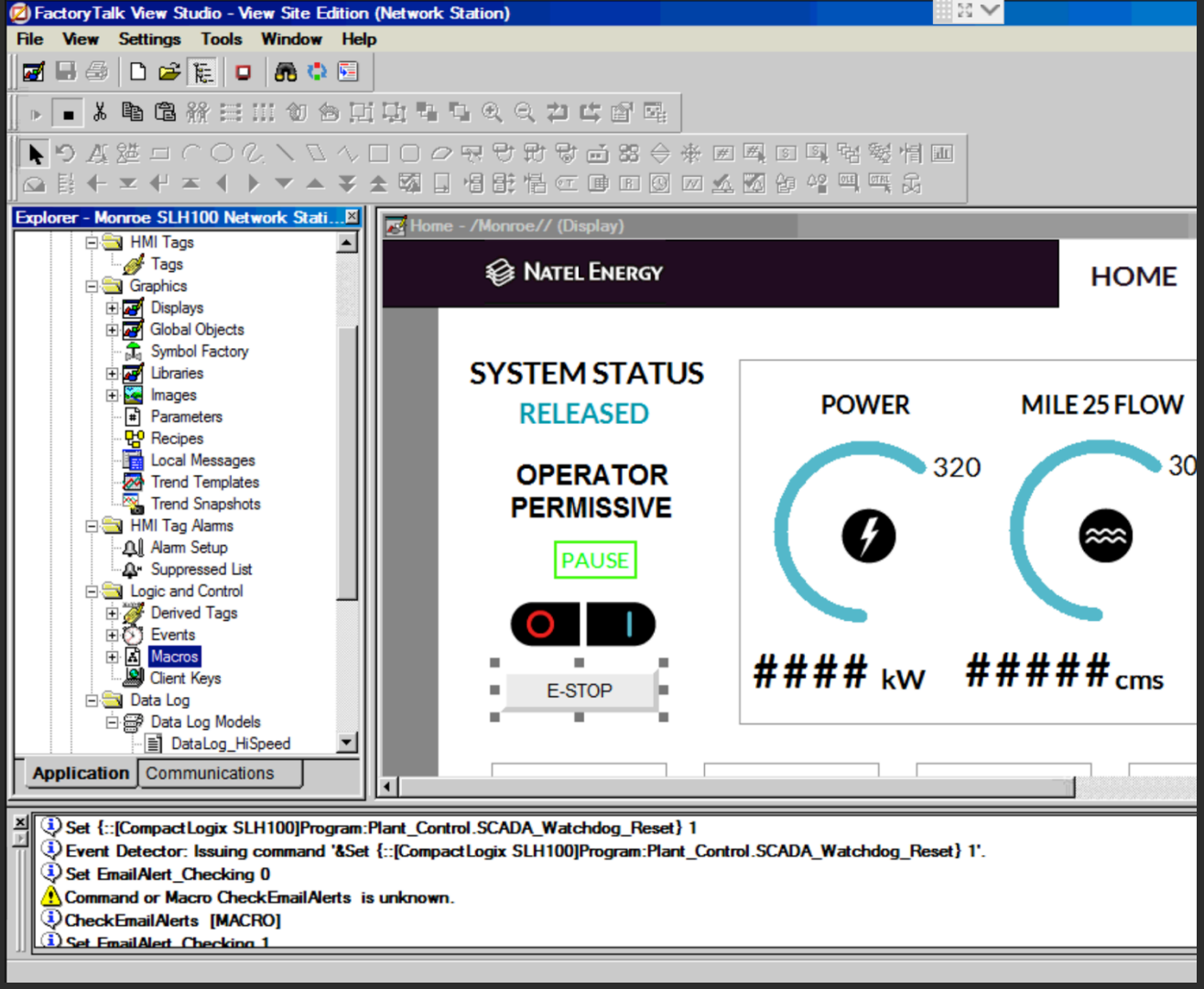
Av. Position | Cyl. Pressure

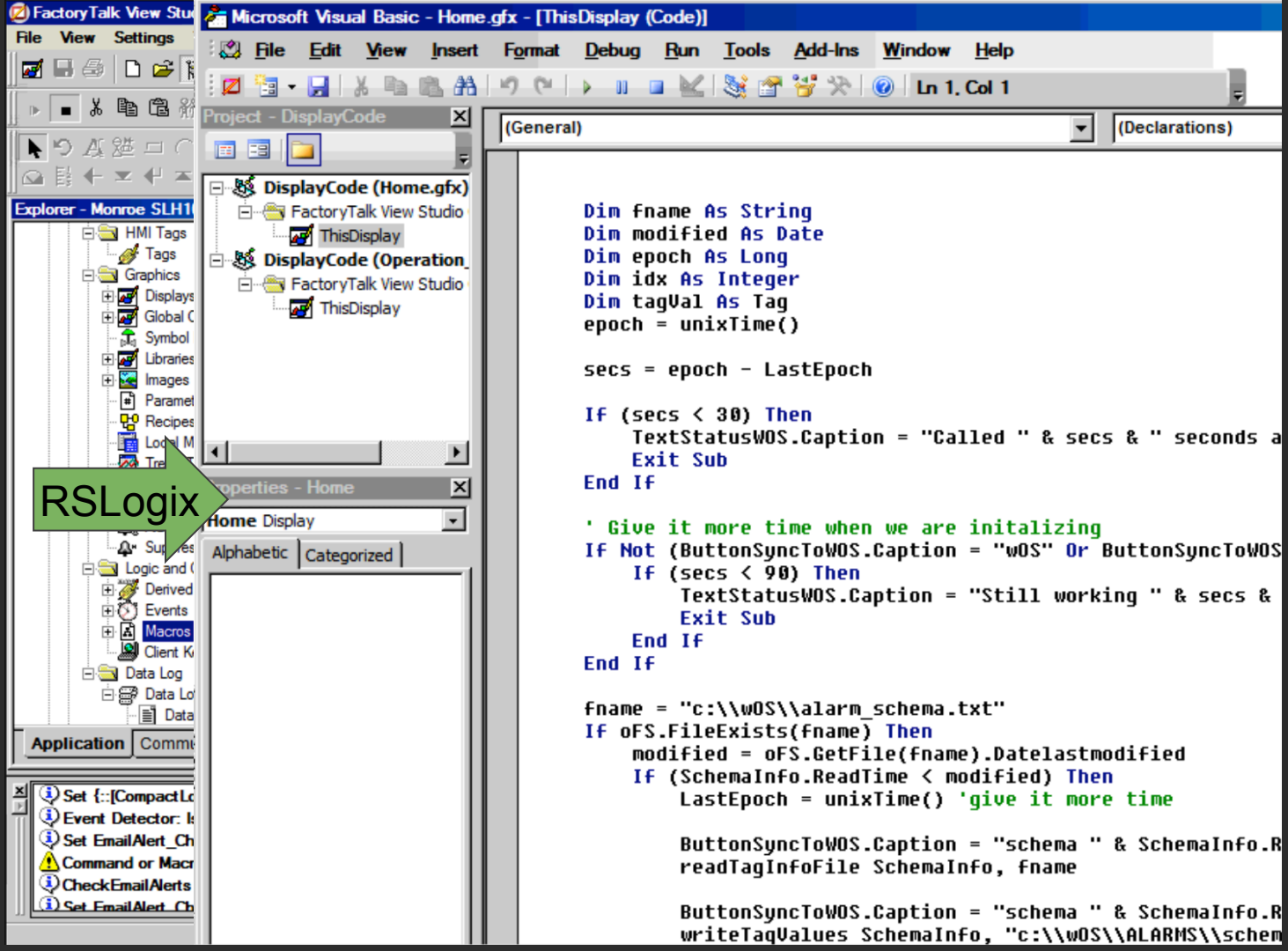


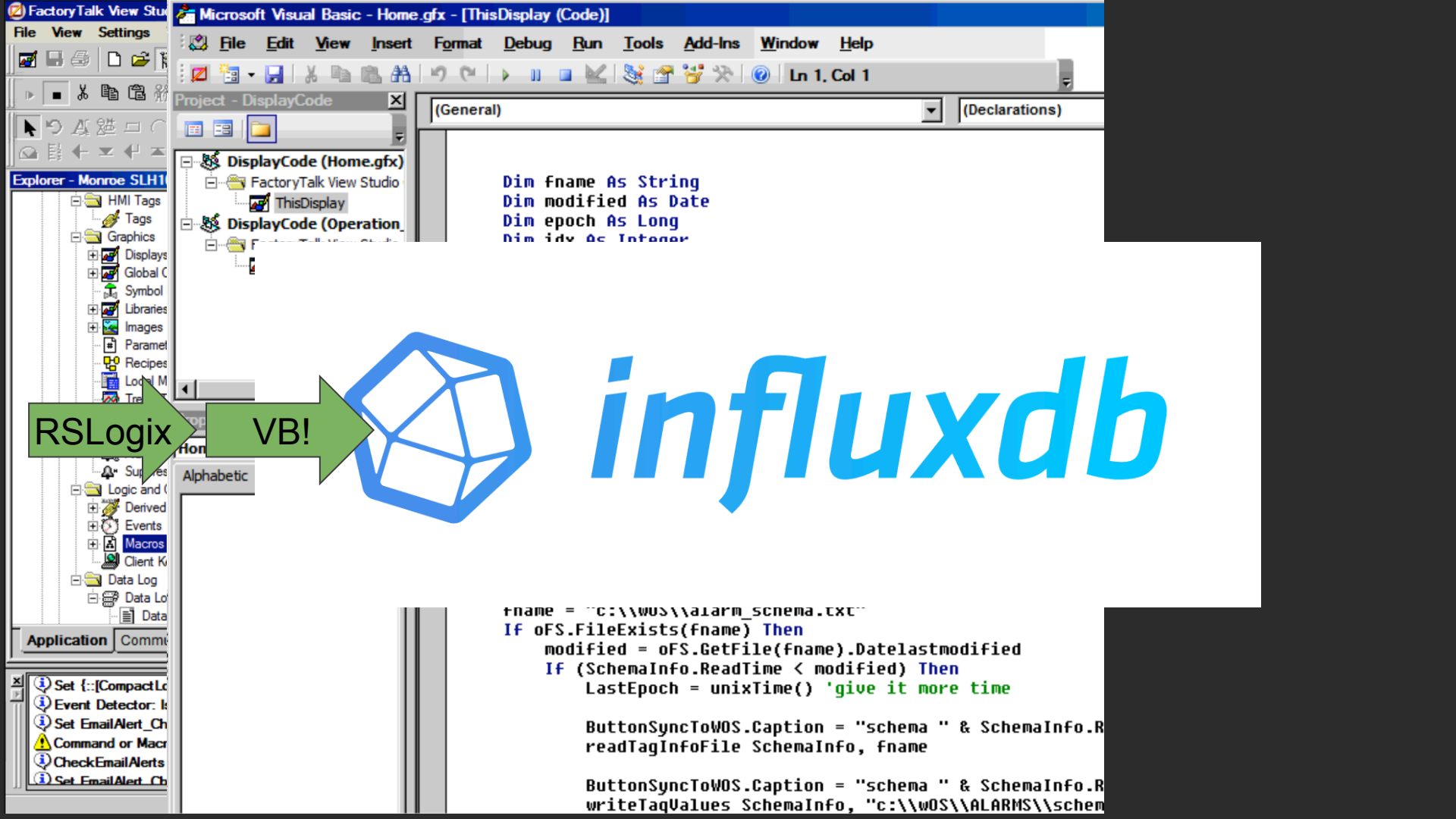

NATEL ENERGY
HOME
STATE
DETAILS
TREND
LOGGED
SLH :
Guidevanes :
CLOSED
Main Accum :
NOT CHARGED
Intake Gate :
CLOSED
PAUSE
Brake :
RELEASED
Generator :
DISCONNECTED
Belt Accum :
NOT CHARGED
Trash Rack :
DISABLED
PLANT
Upper Canal Level 0.2 m
Bypass Open -93 %
Intake Open -0 %
Headwater Level 2.0 m
Tailwater Level 3.1 m
HYDRAULICS
Main Accum Pressure 53 PSI
Belt Cylinder Pressure 1206 PSI
Brake Actuated
GUIDEVANES
GV Av. Angle 94.35 deg
GV1 Position Signal 0.00
GV E-Close
GV Limit Close Switch
POWER
(Equivalent Gen. Speed) 0 RPM
Protection Relay Permissive
Gen Contactor Enable
Gen Power 0.0 kW
Expected Power 0.0 kW
PERFORMANCE
SLH Speed 0 RPM
Flow -2.7 CMS
Gross Head 2.0 m
(Net Head) 0.1 m
Efficiency 0.00
POWERTRAIN HEALTH
Shaft Torque -81.35 kNm
CASSETTE HEALTH
SECONDARY INFO
CONTROLS
SETTINGS
Control Panel Temp, 7.7 degC
Powerhouse Temp, -3.3 degC
Water Temperature -55.0 degC
Mains Power Present
TR Prime / Rotate / Pump Press
Trash Rack Head Loss 1.54 m
Intake Actuator Status
Intake Command Closed / Open
Belt Accum Pressure 1266 PSI
GV1 Cylinder Pressure 25 PSI
Oil Moisture 11 %
Oil Temp
Oil Level
Pump Vibration 0.20 RMS
GV1-1 Angle 94.62 deg
GV1-2 Angle 93.67 deg
GV1-3 Angle 94.53 deg
GV1-4 Angle 94.58 deg
Isolated
Power Factor 1.00
I_A 0.0 A
I_B 0.0 A
I_C 0.0 A
I_N 0.0 A
V_A 278.0 V
V_B 279.0 V
V_C 276.0 V
Penstock Pressure -18.2 PSI
Inlet Pressure -18.0 PSI
Outlet Pressure -18.1 PSI
Draft Tube Pressure 0.80 PSI
Reset Watchdog
0
Gen. Temp Switch
SLH COMMS
PLC Heartbeat
Vibration Monitor


NATEL ENERGY
HOME
STATE
DETAILS
TREND
LOGGED I
HPU
Accum. Press.
Plant
Bypass Flow
Gross Head
SLH
Flow
Draft Tube Pressure
Net Head
Inlet Pressure
Generat
Power
Generator Vibration
PAUSE
Intake Gate : CLOSED
Trash Rack : DISABLED
Guidevanes : CLOSED
Generator : DISCONNECTED
Main Accum. : NOT CHARGED
Belt Accum. : NOT CHARGED
Brake : RELEASED
No Active Major Faults
All Major Faults Acked
GV Closed / Aborted
Gen. Disconnected / Aborted
Intake Gate Closed / Aborted
OFFLINE
E-Close GV : 94.35 / 95.00 deg.
Intake Gate : -0 / 0 %
Disconnect Generator :
IF GV Closed
OR Gen. Power 0 < -2 kW
OR Immediate Disconnect
Major Fault
Run Permissive Granted
OFFLINE
Intake Gate : -0 / 0 %
GV Closed
Gen. Disconnected
Intake Gate Closed
SHUTTING DOWN
Close GV : 94.35 / 95.00 deg.
Intake Gate : -0 / 0 %
Disconnect Generator :
IF GV Closed
OR Gen. Power 0 < -2 kW
Run Permissive Removed
INITIALIZING
Main Accum. :
Belt Accum. :
Intake Gate : -0 / 100 %
Brake : OFF / ON
Main Accum. Charged
Belt Accum. Charged
Intake Gate Opened
Guidevanes Closed
Gen. Disconnected
READY
Brake : OFF / ON
PAUSED
Brake : OFF / ON
YES
NO
Pause Requested ?
GV Closed
Gen. Disconnected
No Pause Request
Bypass Flow (Est.)
33.41 > 2.50 cms
(Canal Level 0.23 m)
(Bypass Open : -93 %)
STOPPING
Disconnect Generator :
IF GV Closed
OR Gen. Power 0 < -2 kW
STARTING
GV Speed Control : 94.35 deg.
Gen. Speed : 0 / 1800 RPM
Brake : OFF / OFF
Pause Request
Gen. Power
GV1 Max Opened
Generator speed within 1800 +/- 4 RPM for 0 / 1000 ms.
RUNNING
(No Filter)
Event Time
Alarm Name
Condition N...
Message
...LH_Blade_Trans8Alarm_Abort HIHI
...Control.Button_Estop_ALARM TRIP The emergency
...trol.Fluid_Level_Canal_ALARM LO Upper canal be
...trol.Fluid_Level_Canal_ALARM LOLO Upper canal ex
...Control.Gate_Bypass_ALARM TRIP Bypass gate is
..._Level_Canal_Critical_ALARM LOLO Upper Canal Le
...Control.SLH_Brg_Vib_ALARM HIHI One or more SL
...Control.SLH_Brg_Vib_ALARM HI One or more SL
No message selected.

:(


FactoryTalk View Studio - View Site Edition (Network Station)
File View Settings Tools Window Help
Explorer - Monroe SLH100 Network Stati...
HMI Tags
Tags
Graphics
Displays
Global Objects
Symbol Factory
Libraries
Images
Parameters
Recipes
Local Messages
Trend Templates
Trend Snapshots
HMI Tag Alarms
Alarm Setup
Suppressed List
Logic and Control
Derived Tags
Events
Macros
Client Keys
Data Log
Data Log Models
DataLog_HiSpeed
Application
Communications
Home - /Monroe// (Display)
NATEL ENERGY
HOME
SYSTEM STATUS
RELEASED
OPERATOR PERMISSIVE
PAUSE
E-STOP
POWER
320
MILE 25 FLOW
30
kW
cms
Set {::[CompactLogix SLH100]Program:Plant_Control.SCADA_Watchdog_Reset} 1
Event Detector: Issuing command '&Set {::[CompactLogix SLH100]Program:Plant_Control.SCADA_Watchdog_Reset} 1'.
Set EmailAlert_Checking 0
Command or Macro CheckEmailAlerts is unknown.
CheckEmailAlerts [MACRO]
Set EmailAlert_Checking 1


FactoryTalk View Stu
File View Settings
Explorer - Monroe SLH1
HMI Tags
Tags
Graphics
Displays
Global C
Symbol
Libraries
Images
Paramet
Recipes
Logic and
Derived
Events
Macros
Client K
Data Log
Data
Application
Comm
RSLogix
Microsoft Visual Basic - Home.gfx - [ThisDisplay (Code)]
File Edit View Insert Format Debug Run Tools Add-Ins Window Help
Ln 1, Col 1
Project - DisplayCode
DisplayCode (Home.gfx)
FactoryTalk View Studio
ThisDisplay
DisplayCode (Operation_
FactoryTalk View Studio
ThisDisplay
Properties - Home
Home Display
Alphabetic
Categorized
(General)
(Declarations)
Dim fname As String
Dim modified As Date
Dim epoch As Long
Dim idx As Integer
Dim tagVal As Tag
epoch = unixTime()
secs = epoch - LastEpoch
If (secs < 30) Then
TextStatusWOS.Caption = "Called " & secs & " seconds a
Exit Sub
End If
' Give it more time when we are initalizing
If Not (ButtonSyncToWOS.Caption = "wOS" Or ButtonSyncToWOS
If (secs < 90) Then
TextStatusWOS.Caption = "Still working " & secs &
Exit Sub
End If
End If
fname = "c:\\wOS\\alarm_schema.txt"
If oFS.FileExists(fname) Then
modified = oFS.GetFile(fname).Datelastmodified
If (SchemaInfo.ReadTime < modified) Then
LastEpoch = unixTime() 'give it more time
ButtonSyncToWOS.Caption = "schema " & SchemaInfo.R
readTagInfoFile SchemaInfo, fname
ButtonSyncToWOS.Caption = "schema " & SchemaInfo.R
writeTagValues SchemaInfo, "c:\\wOS\\ALARMS\\schem
Set {::[CompactLo
Event Detector: Is
Set EmailAlert_Ch
Command or Macr
CheckEmailAlerts
Set EmailAlert_Ch


FactoryTalk View Stu
File View Settings
Explorer - Monroe SLH1
HMI Tags
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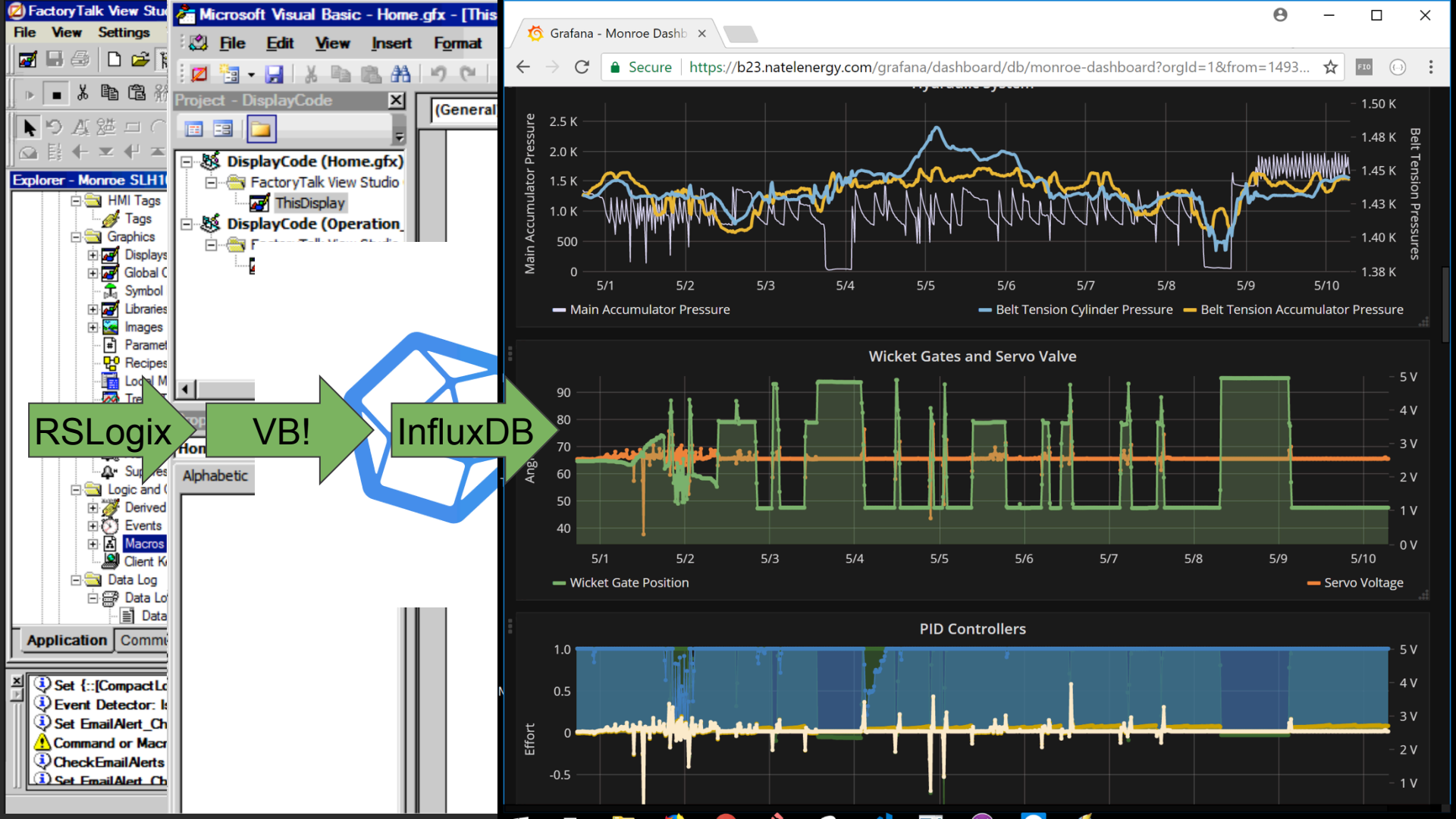
Logic and
Derived
Events
Macros
Client K
Data Log
Data
Application
Set {::[Compact
Event Detector:
Set EmailAlert_Ch
Command or Macr
CheckEmailAlerts
Microsoft Visual Basic - Home.gfx - [ThisDisplay (Code)]
File Edit View Insert Format Debug Run Tools Add-Ins Window Help
Ln 1, Col 1
Project - DisplayCode
DisplayCode (Home.gfx)
FactoryTalk View Studio
ThisDisplay
DisplayCode (Operation
(General)
(Declarations)
Alphabetic
Dim fname As String
Dim modified As Date
Dim epoch As Long
fname = "c:\\wos\\alarm_schema.txt"
If oFS.FileExists(fname) Then
modified = oFS.GetFile(fname).Datelastmodified
If (SchemaInfo.ReadTime < modified) Then
LastEpoch = unixTime() 'give it more time
ButtonSyncToWOS.Caption = "schema " & SchemaInfo.R
readTagInfoFile SchemaInfo, fname
ButtonSyncToWOS.Caption = "schema " & SchemaInfo.R
writeTagValues SchemaInfo, "c:\\wOS\\ALARMS\\schem
RSLogix
VB!
influxdb


FactoryTalk View Stu
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Explorer - Monroe SLH1
HMI Tags
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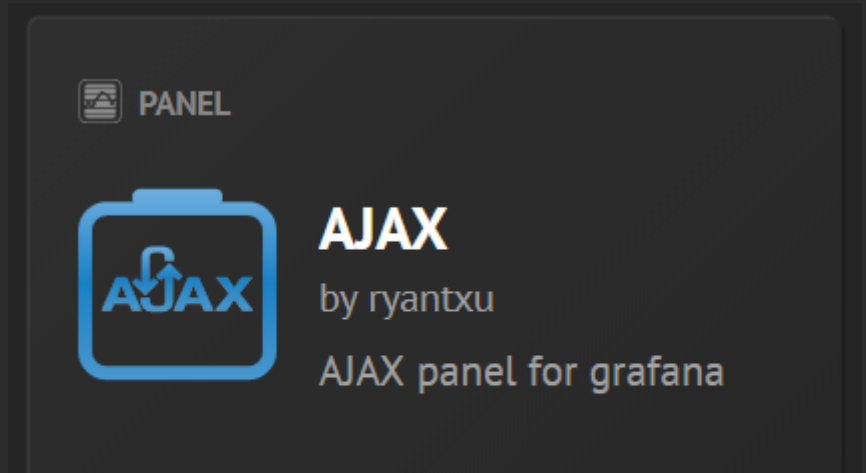
Paramet
Recipes
Local M
Logic and
Derived
Events
Macros
Client K
Data Log
Data Lo
Data
Application
Comm
Set {::[CompactLo
Event Detector: Is
Set EmailAlert_Ch
Command or Macr
CheckEmailAlerts
Set EmailAlert_Ch
Microsoft Visual Basic - Home.gfx - [This
File Edit View Insert Format
Project - DisplayCode
(General
DisplayCode (Home.gfx)
FactoryTalk View Studio
ThisDisplay
DisplayCode (Operation_
Alphabetic
RSLogix
VB!
InfluxDB
Grafana - Monroe Dashb
Secure
https://b23.natelenergy.com/grafana/dashboard/db/monroe-dashboard?orgId=1&from=1493...
Main Accumulator Pressure
Belt Tension Pressures
2.5 K
2.0 K
1.5 K
1.0 K
500
0
1.50 K
1.48 K
1.45 K
1.43 K
1.40 K
1.38 K
5/1
5/2
5/3
5/4
5/5
5/6
5/7
5/8
5/9
5/10
Main Accumulator Pressure
Belt Tension Cylinder Pressure
Belt Tension Accumulator Pressure
Wicket Gates and Servo Valve
90
80
70
60
50
40
5 V
4 V
3 V
2 V
1 V
0 V
Wicket Gate Position
Servo Voltage
PID Controllers
Effort
1.0
0.5
0
-0.5

:)

What about custom content?

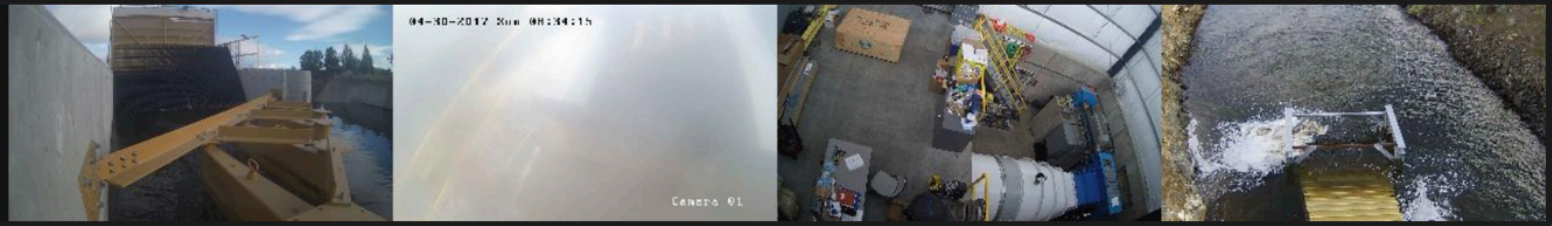
https://github.com/ryantxu/ajax-panel



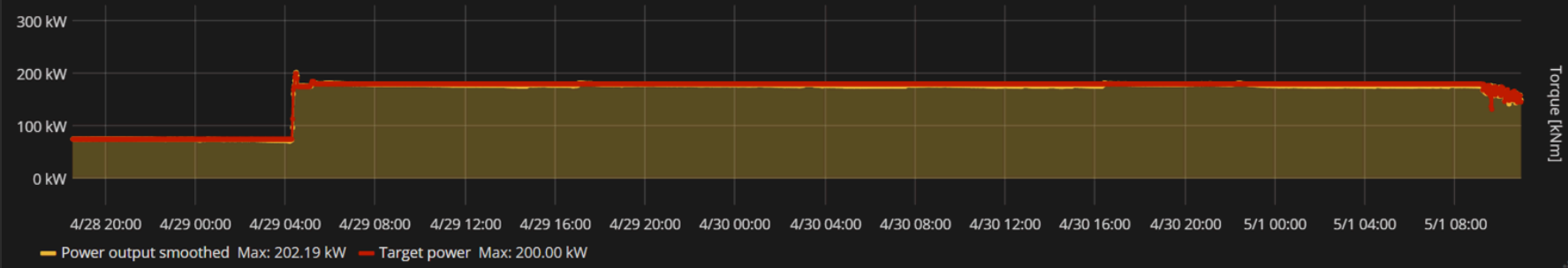
Web Cameras

1:41:53 PM

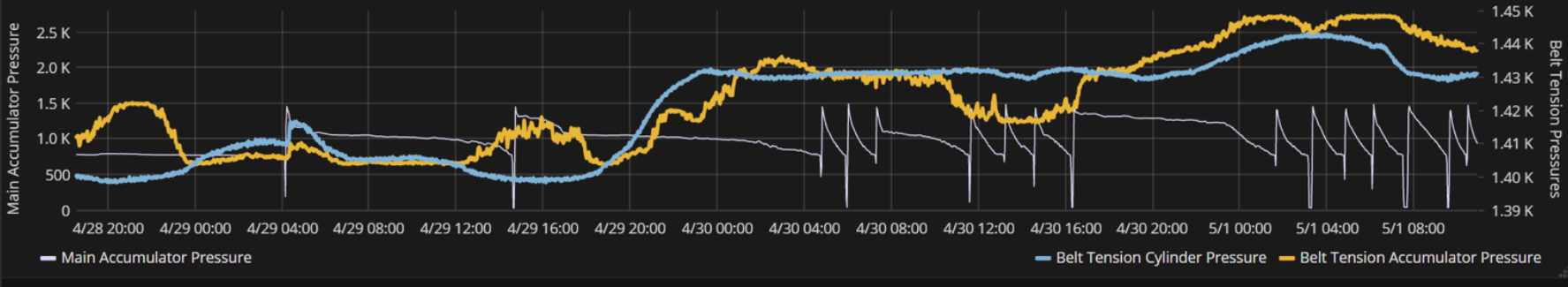
179 kW
Sunday
8:15 AM
2017-04-30



Generator Power (kW)



Hydraulic System



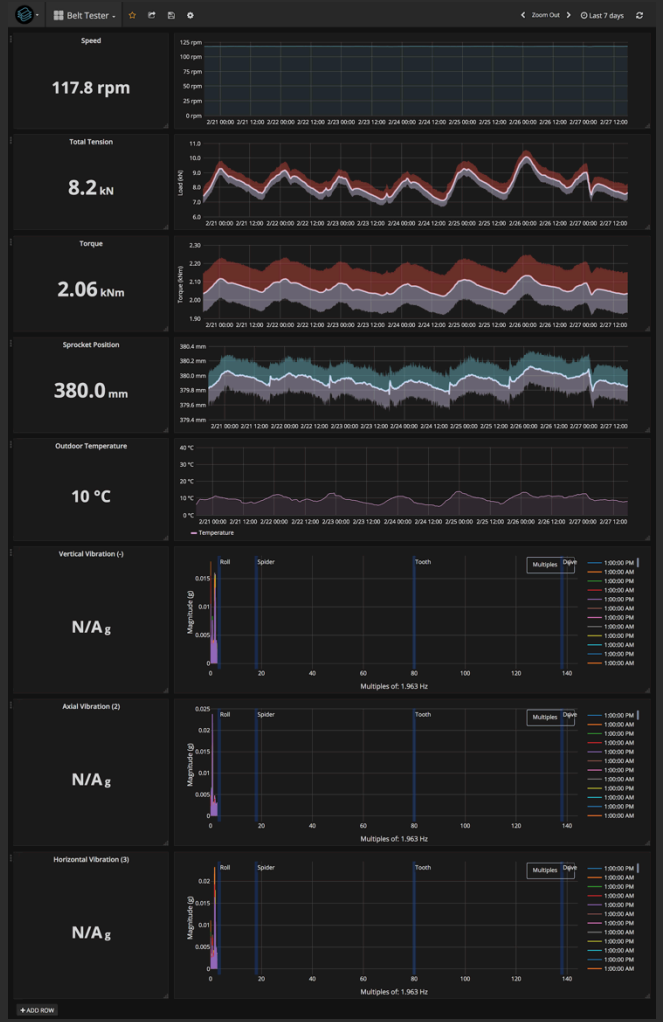
The team loves it…

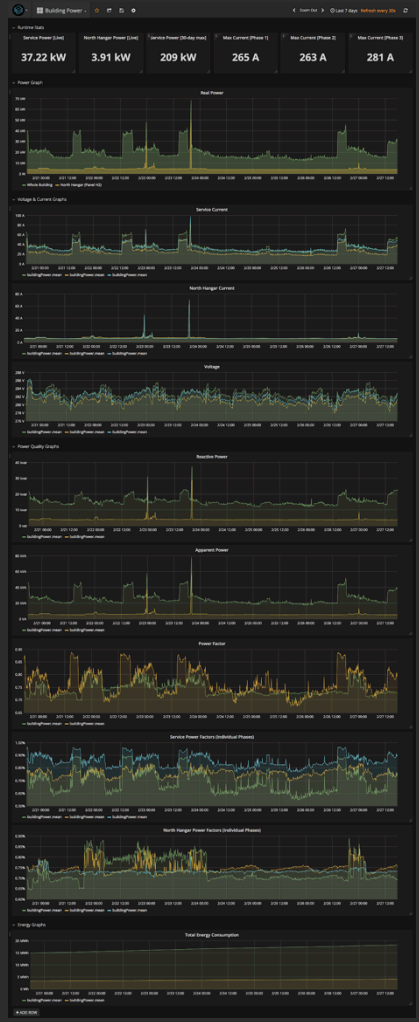
The team loves it…
and want more!

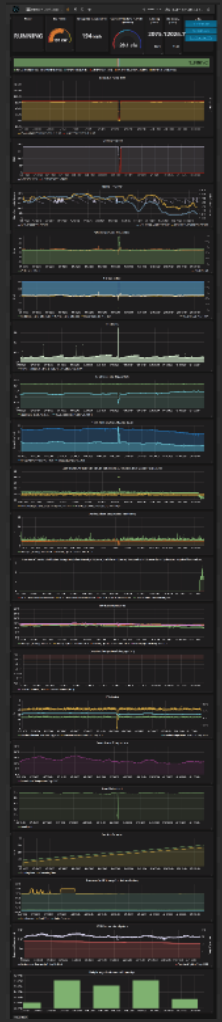
What about data/performance analysis?

Plot.ly for non-time series

Plot.ly for non-time series


Belt Tester
Zoom Out
Last 7 days
Speed
117.8 rpm
Total Tension
8.2 kN
Load (kN)
Torque
2.06 kNm
Torque (kNm)
Sprocket Position
380.0 mm
Outdoor Temperature
10 °C
Temperature
Vertical Vibration (-)
N/A g
Axial Vibration (2)
N/A g
Horizontal Vibration (3)
N/A g
Roll
Spider
Tooth
Multiples
Magnitude (g)
Multiples of: 1.963 Hz
+ ADD ROW


Building Power
Runtime Stats
Service Power (Live)
37.22 kW
North Hangar Power (Live)
3.91 kW
Service Power (30-day max)
209 kW
Max Current (Phase 1)
265 A
Max Current (Phase 2)
263 A
Max Current (Phase 3)
281 A
Power Graph
Real Power
Voltage & Current Graphs
Service Current
North Hangar Current
Voltage
Power Quality Graphs
Reactive Power
Apparent Power
Power Factor
Service Power Factors (Individual Phases)
North Hangar Power Factors (Individual Phases)
Energy Graphs
Total Energy Consumption
+ ADD ROW



Control System Update

System Needs:

- Remote Monitoring & Diagnostics
- Direct System Control
- Expert vs Novice operator

Issues with off-the-shelf Grafana

- Zooming from micro to macro problems
- What units are these variables in?
- Non-numeric values… FFT, Strings.
- No X,Y plots.
- Need Fault display / control.
- Need UI for command and data input.

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- Need UI for command and data input.

➔ Custom influx datasource.
➔ Sync units/comments from PLC.
➔ Panels for FFTs and Strings.
➔ Panel for X,Y (plot.ly)
➔ Panels for faults.
➔ Panels for buttons and data input for plant control.

The “Cloud”

InfluxDB

Grafana

https://
upload

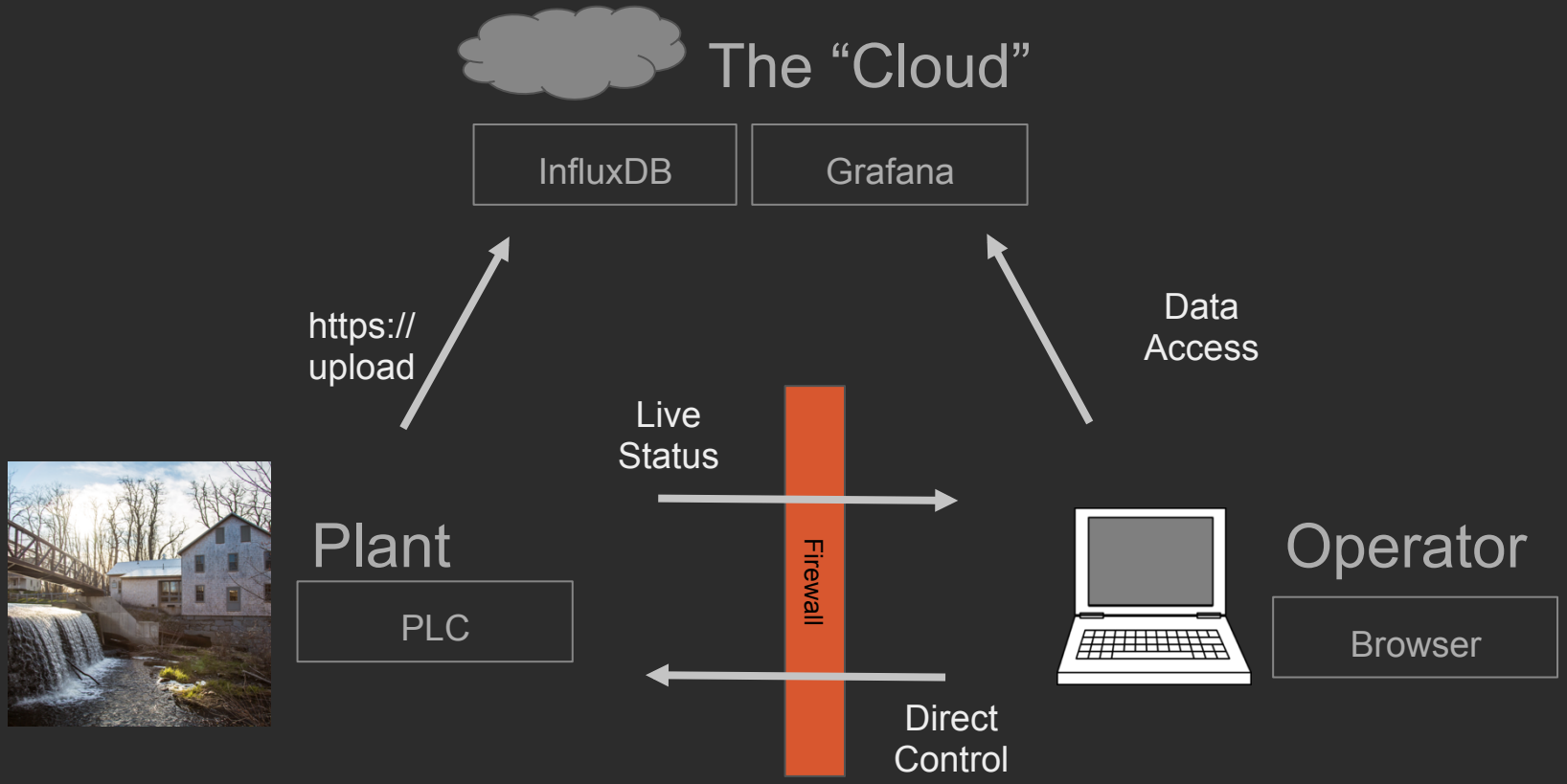
Data
Access

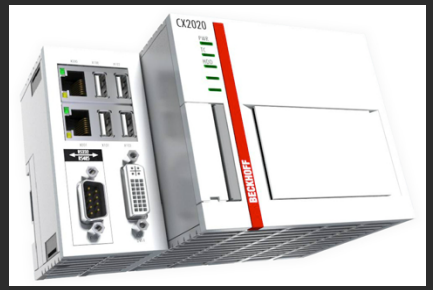
Plant

PLC

Operator

Browser


The “Cloud”
InfluxDB
Grafana
https://
upload
Data
Access
Live
Status
Firewall
Plant
PLC
Operator
Browser
Direct
Control



- Real Time Controller

Natel Agent (C#)

- Publish Variable List
- Manage data logging
- Exposes Write API

Grafana

- Simple Local UI
- Websocket streaming

natel/ap ×

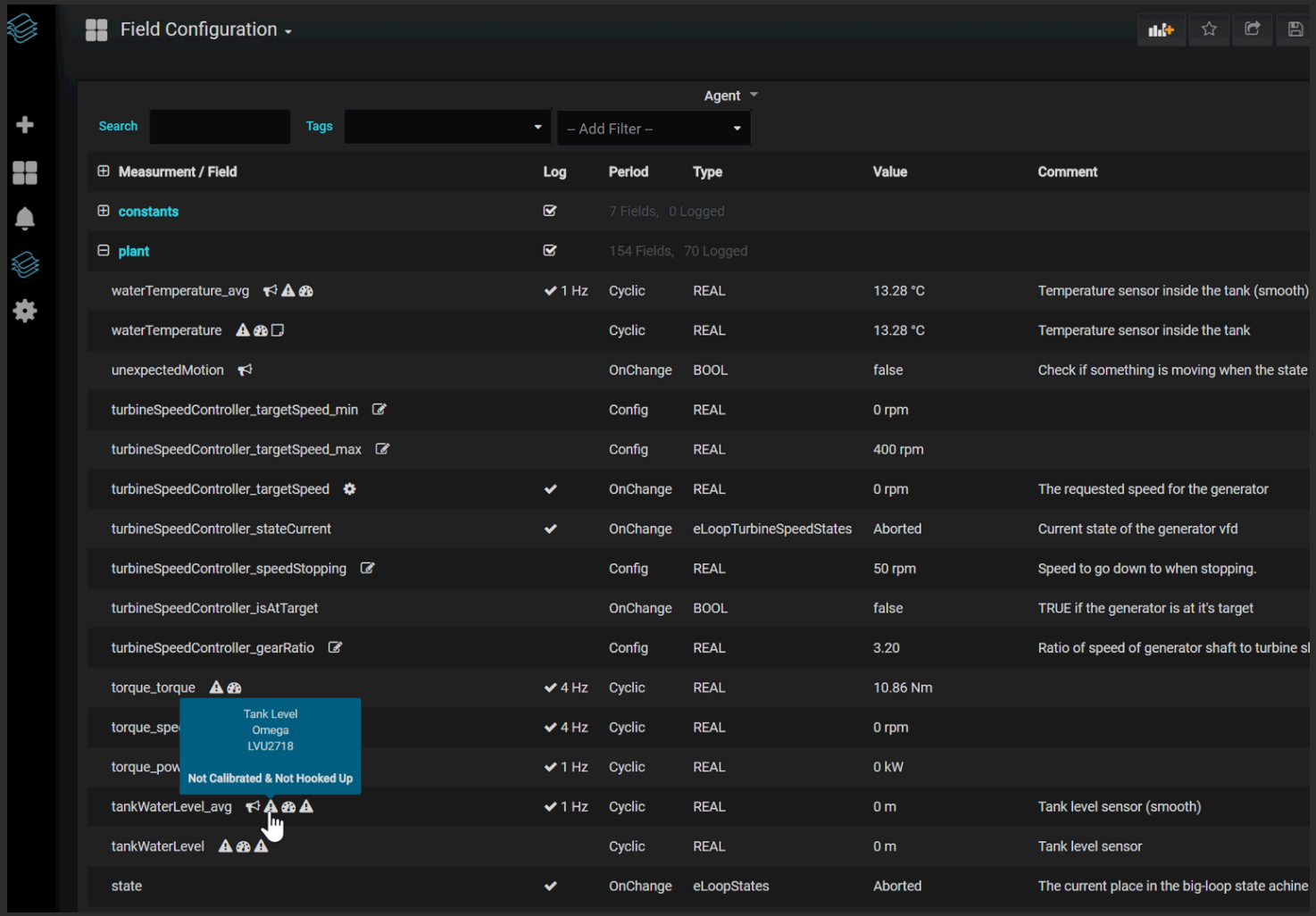
natel/api/status.json

```
{
  "site": "Freedom",
  "state": {
    "running": true,
    "notice": 1519740709373,
    "update": 1519740726000,
    "when": 1519740727007,
    "started": {
      "agent": 1517239217775,
      "realtime": 28800024
    }
  },
  "ads": { … }, // 5 items
  "fields": [
    {
      "measurement": "turbine",
      "period": "Cyclic",
      "interval": 1000,
      "name": "velocityRatioBladeOverJet",
      "path": "MAIN.plant.turbine.perform.velo
      "type": "REAL",
      "influx": "FLOAT",
      "logging": true,
      "last": [
        0,
        1519740726770
      ]
    },
    {
      "measurement": "turbine",
      "period": "Cyclic",
      "interval": 1000,
      "name": "velocityJet",
      "path": "MAIN.plant.turbine.perform.velo
      "units": "velocityms",
      "type": "REAL",
      "influx": "FLOAT",
      "logging": true,
      "last": [
        17.6876945,
        1519740726770
      ]
    },
    {
      "measurement": "turbine",
      "period": "Cyclic",
```

```
    "movingAverage": "MAIN.plant.turbine.speed.movingAverag
  },
  {
    "measurement": "turbine",
    "period": "Cyclic",
    "interval": 1000,
    "name": "pressureJetDeflectorAir_avg",
    "path": "MAIN.plant.turbine.pressureJetDeflectorAir.mov
    "units": "pressurepsi",
    "type": "REAL",
    "comment": "Used to raise the jet deflector. (smooth)",
    "influx": "FLOAT",
    "logging": false,
    "faults": [
      "MAIN.plant.turbine.pressureJetDeflectorAirFault"
    ],
    "last": [
      0.03259311,
      1519740726770
    ]
  },
  {
    "measurement": "turbine",
    "period": "Cyclic",
    "interval": 1000,
    "name": "pressureJetDeflectorAir",
    "path": "MAIN.plant.turbine.pressureJetDeflectorAir.ins
    "units": "pressurepsi",
    "type": "REAL",
    "comment": "Used to raise the jet deflector.",
    "influx": "FLOAT",
    "logging": false,
    "instrument": {
      "InstrumentNum": 23,
      "Description": "Pressure Transmitters",
      "Manufacturer": "Prosense",
      "ManufacturerPartNum": "SPT25-20-0200A",
      "PowerVoltageMin": 9,
      "PowerVoltageMax": 36,
      "PowerVoltageUnit": "Vdc",
      "PowerCurrent": 4,
      "PowerCurrentUnit": "mA"
```

Custom Datasource

- Fields from PLC/config file
- Syncs units from PLC/documentation
- Websocket for current value & recent history
- Delegate to Influx for historic data


Field Configuration
Agent
Search
Tags
-- Add Filter --
Measurment / Field
Log
Period
Type
Value
Comment
constants
7 Fields, 0 Logged
plant
154 Fields, 70 Logged
waterTemperature_avg
1 Hz
Cyclic
REAL
13.28 °C
Temperature sensor inside the tank (smooth)
waterTemperature
Cyclic
REAL
13.28 °C
Temperature sensor inside the tank
unexpectedMotion
OnChange
BOOL
false
Check if something is moving when the state
turbineSpeedController_targetSpeed_min
Config
REAL
0 rpm
turbineSpeedController_targetSpeed_max
Config
REAL
400 rpm
turbineSpeedController_targetSpeed
OnChange
REAL
0 rpm
The requested speed for the generator
turbineSpeedController_stateCurrent
OnChange
eLoopTurbineSpeedStates
Aborted
Current state of the generator vfd
turbineSpeedController_speedStopping
Config
REAL
50 rpm
Speed to go down to when stopping.
turbineSpeedController_isAtTarget
OnChange
BOOL
false
TRUE if the generator is at it's target
turbineSpeedController_gearRatio
Config
REAL
3.20
Ratio of speed of generator shaft to turbine sl
torque_torque
4 Hz
Cyclic
REAL
10.86 Nm
Tank Level
Omega
LVU2718
Not Calibrated & Not Hooked Up
4 Hz
Cyclic
REAL
0 rpm
1 Hz
Cyclic
REAL
0 kW
tankWaterLevel_avg
1 Hz
Cyclic
REAL
0 m
Tank level sensor (smooth)
tankWaterLevel
Cyclic
REAL
0 m
Tank level sensor
state
OnChange
eLoopStates
Aborted
The current place in the big-loop state achine

Field Configuration

Search Tags

- Measurment / Field
- constants
- plant
  - waterTemperature_avg
  - waterTemperature
  - unexpectedMotion
  - turbineSpeedController_targetSpeed_mi
  - turbineSpeedController_targetSpeed_ma
  - turbineSpeedController_targetSpeed
  - turbineSpeedController_stateCurrent
  - turbineSpeedController_speedStopping
  - turbineSpeedController_isAtTarget
  - turbineSpeedController_gearRatio
  - torque_torque
  - torque_spe
  - torque_pow
  - tankWaterLevel_avg
  - tankWaterLevel
  - state

Tank Level
Omega
LVU2718
Not Calibrated & Not Hooked Up

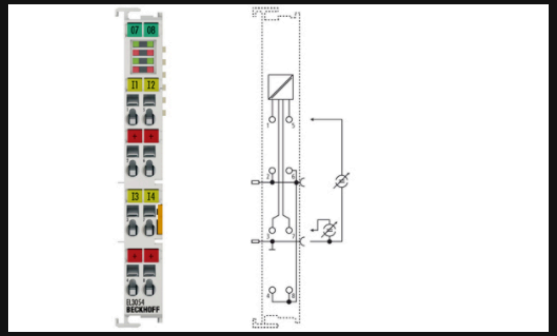
Agent

tankWaterLevel_avg

Info | Instrument | Calibration | Wiring

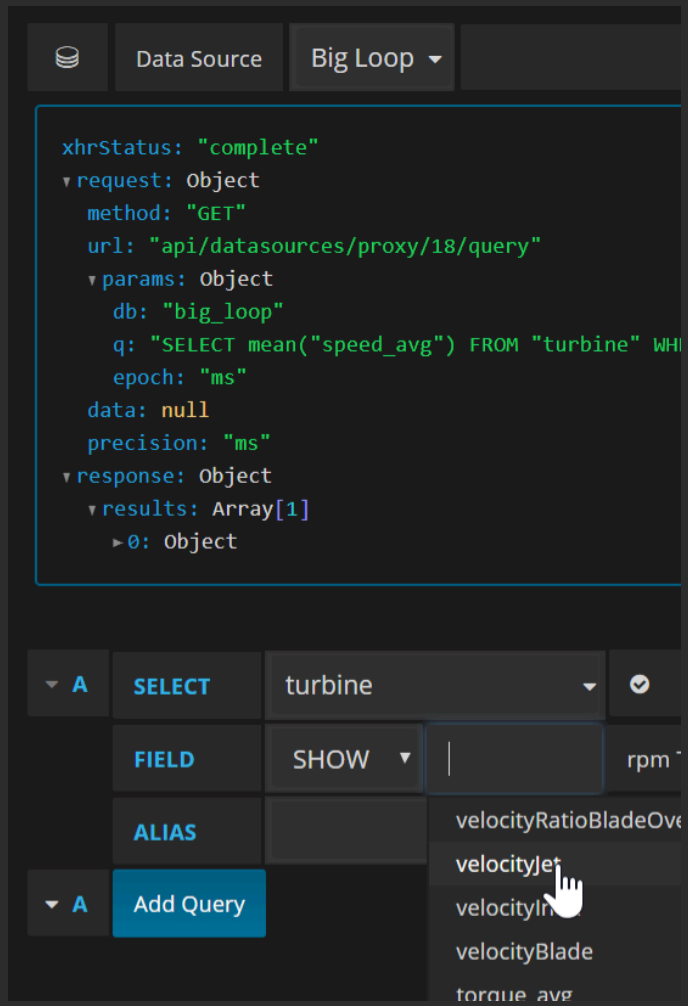
LOOP-CABINET // Terminal: 7

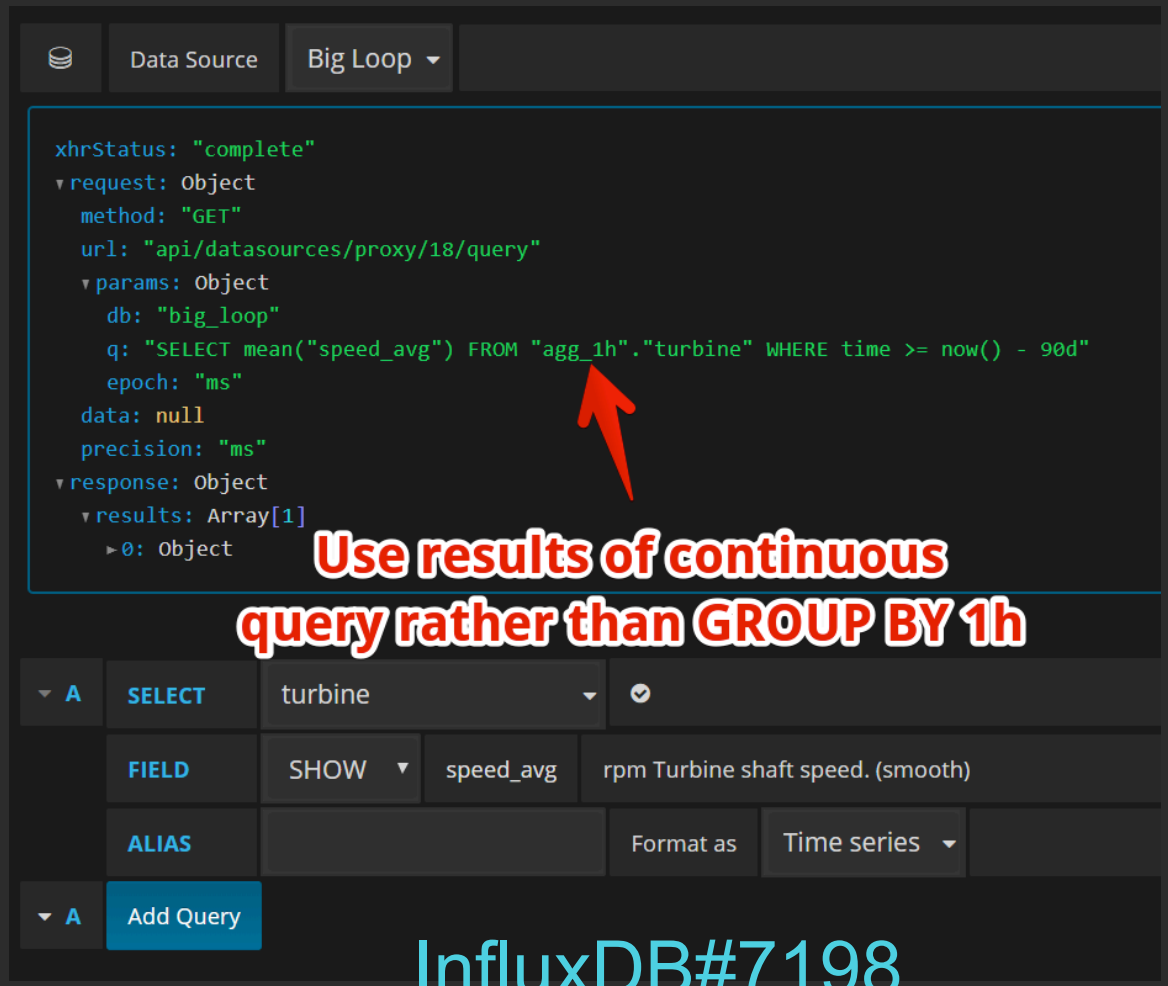

```
{
  "PartNum": "EL3054",
  "Position": "5",
  "Channel": "Channel 2",
  "Type": "ANALOG",
  "EtherCATLow": 0,
  "EtherCATHigh": 32767,
  "TerminalElectricalLow": 4,
  "TerminalElectricalHigh": 20,
  "TerminalElectricalUnit": "mA"
}
```

Cables:

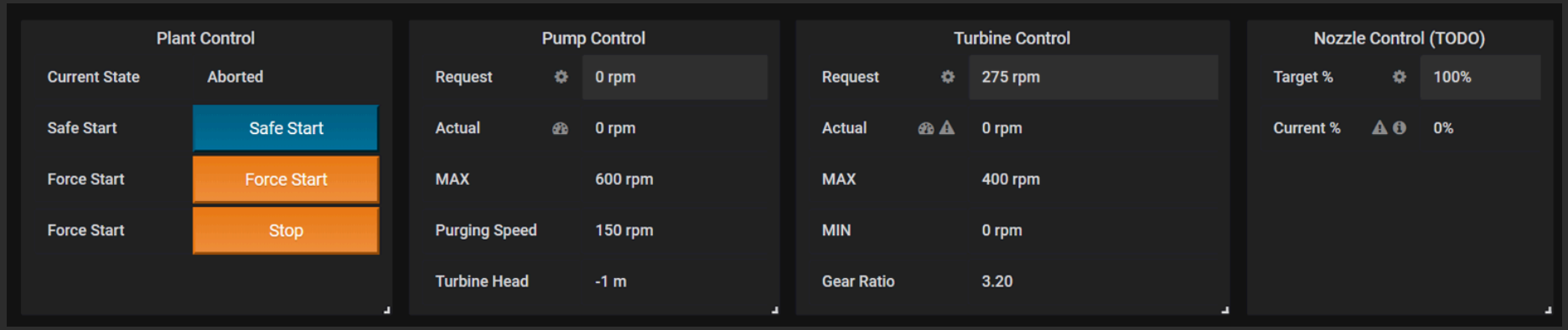

```
{
  "Cabinet": "LOOP-CABINET",
  "CableId": "tankLevelSensor",
  "Color": "Grey",
  "Conductors": [
    {
      "Purpose": "Input 2",
      "Position": "5"
    },
    {
      "Purpose": "24 V",
      "Position": "6"
    }
  ]
}
```



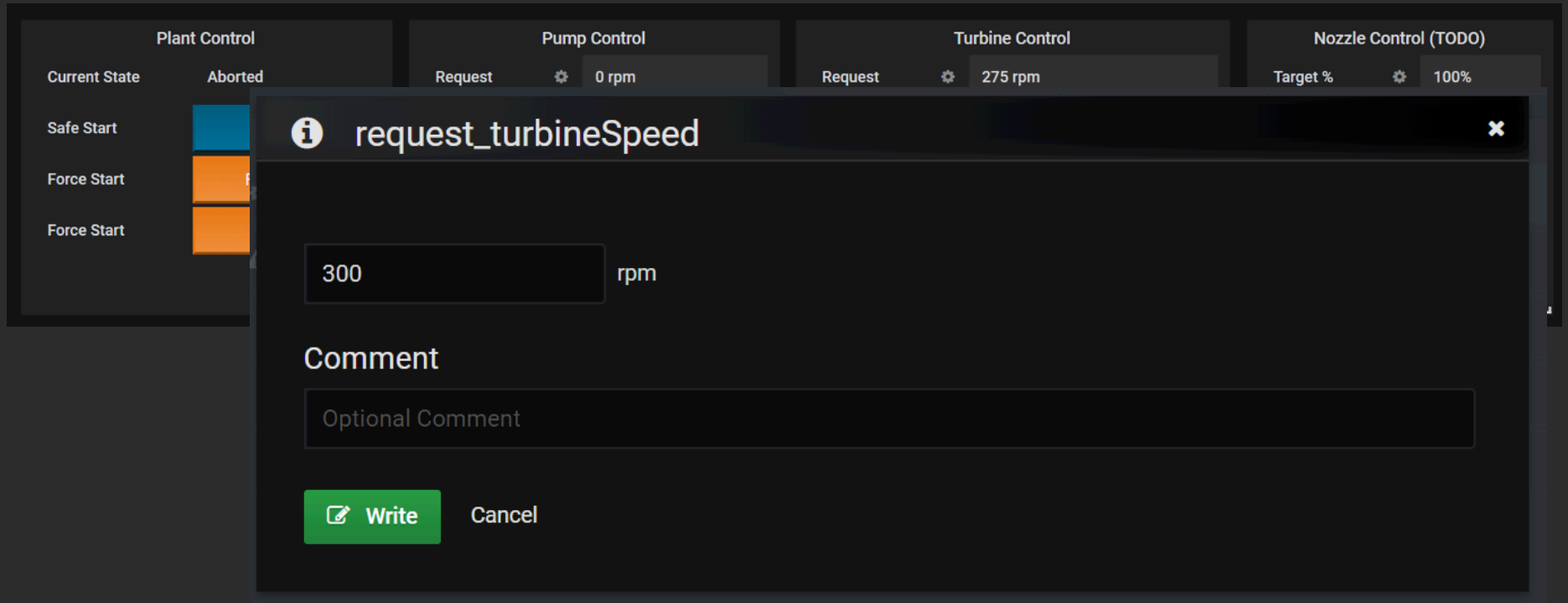


InfluxDB#7198

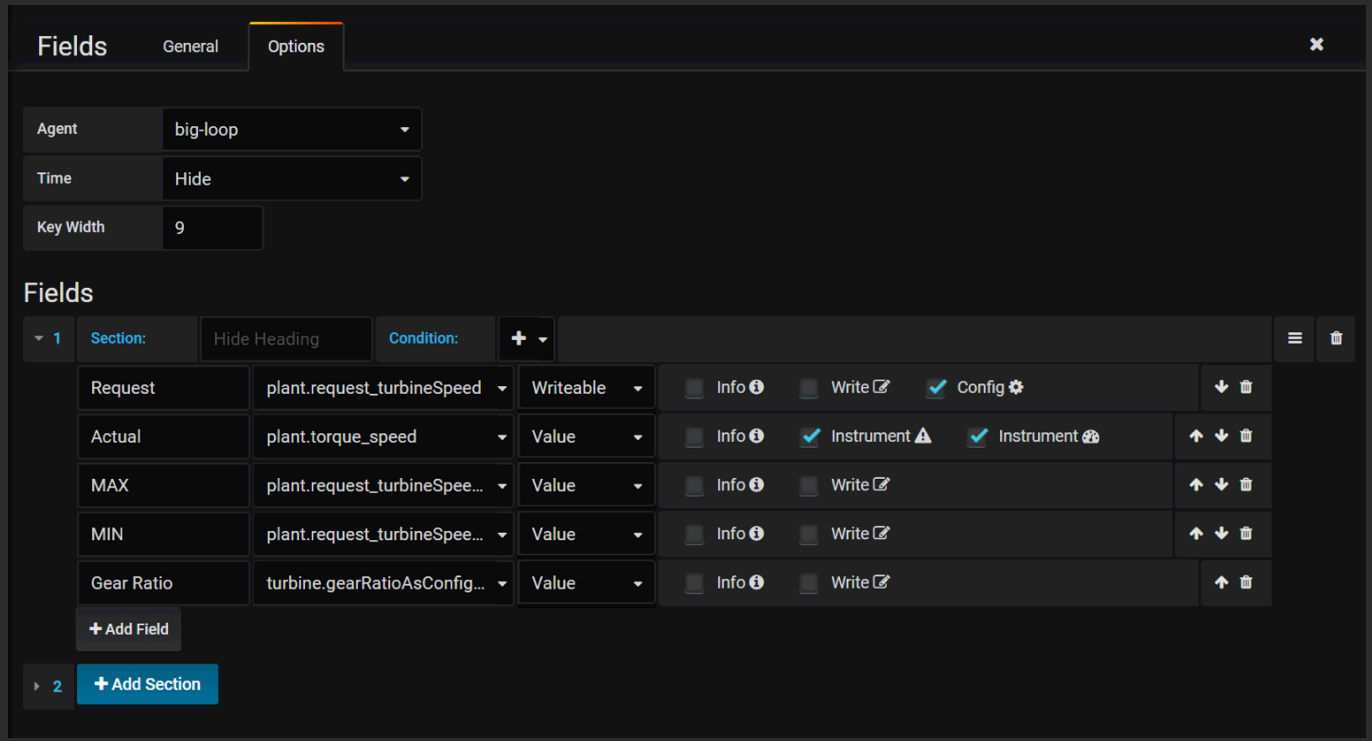
Field Display / Editor



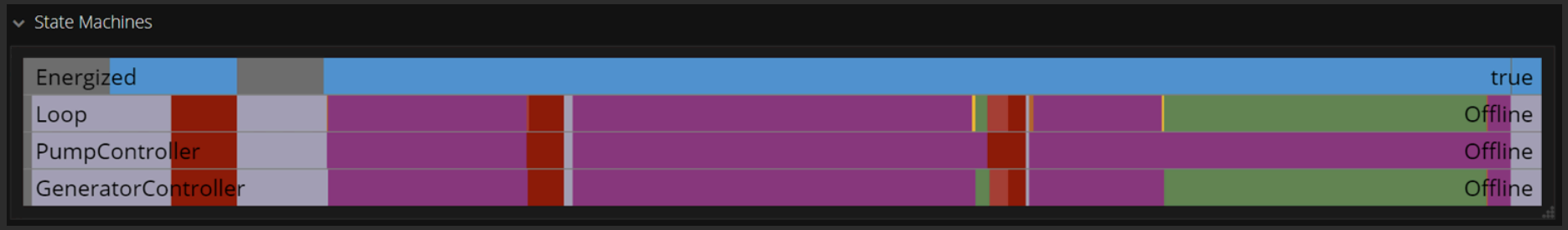
Field Display / Editor

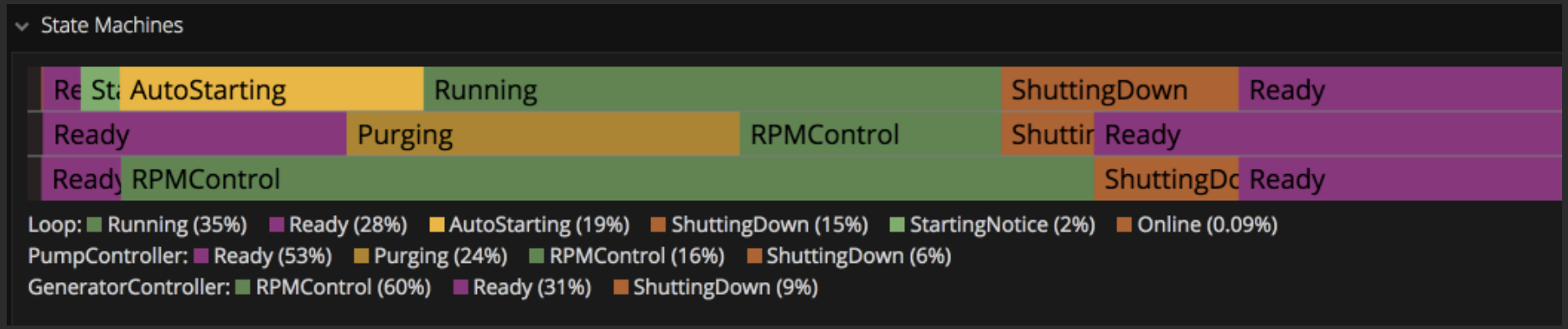


Field Display / Editor

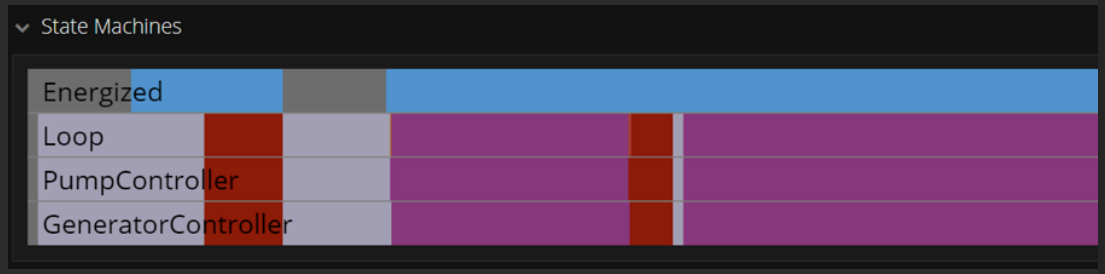


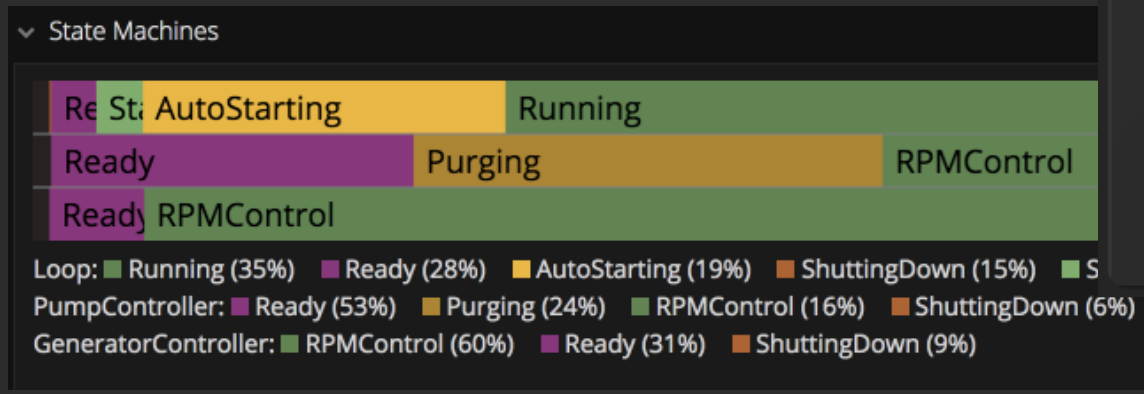
State Machine Transitions

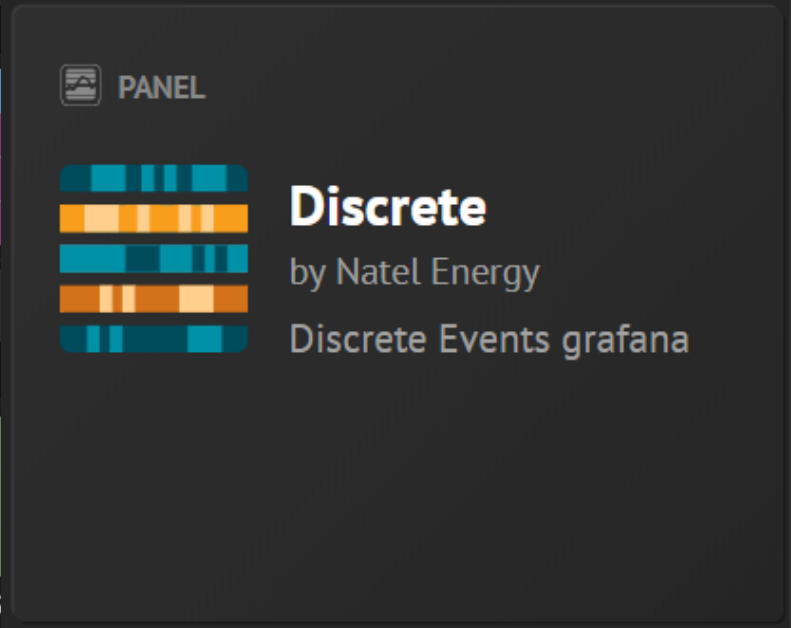




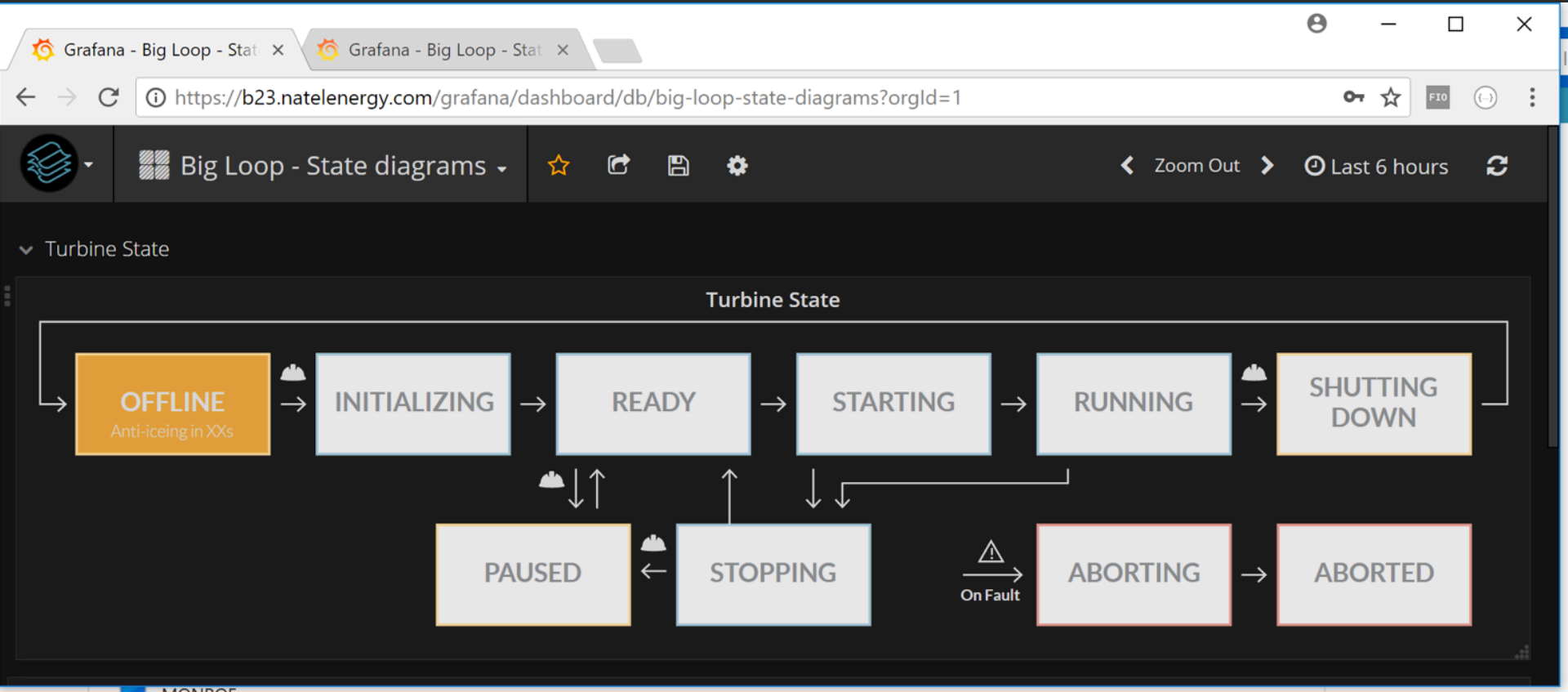
State Machine Transitions



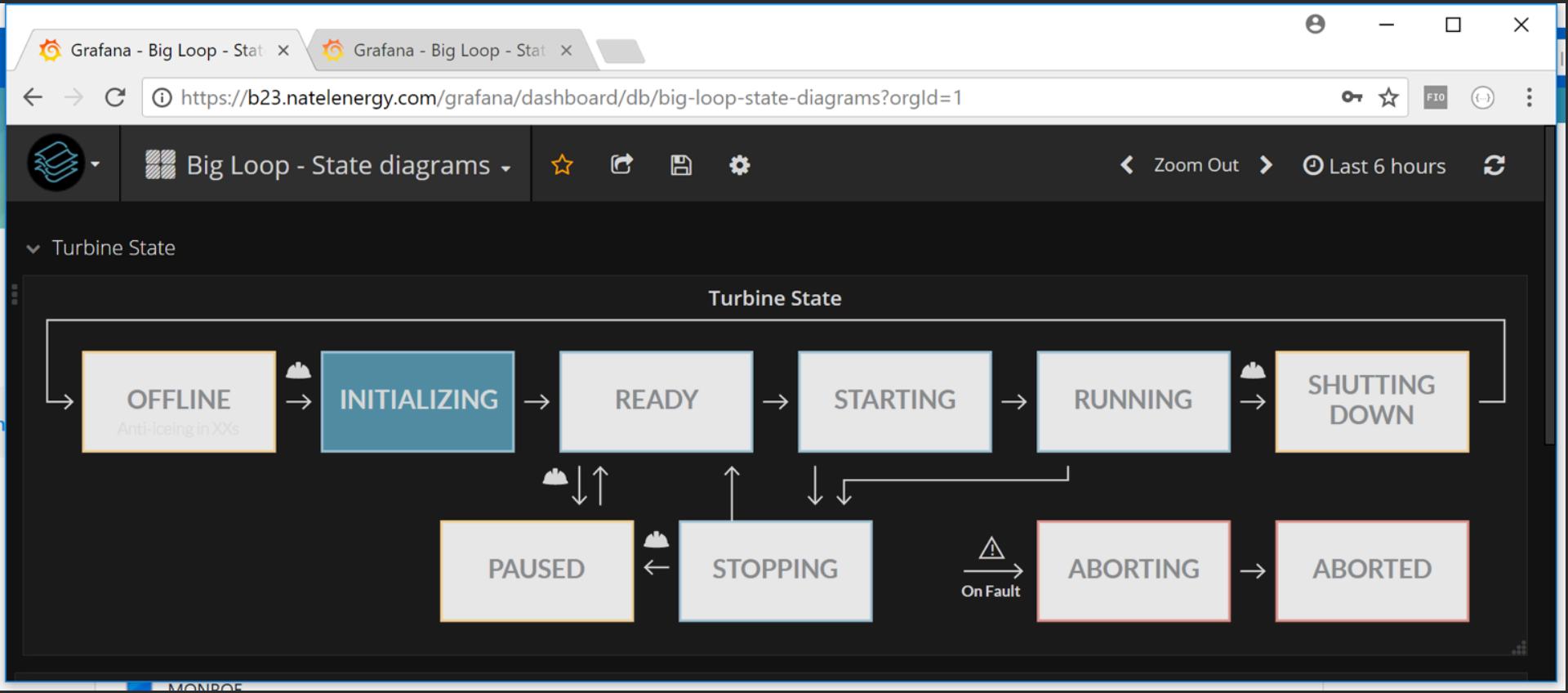




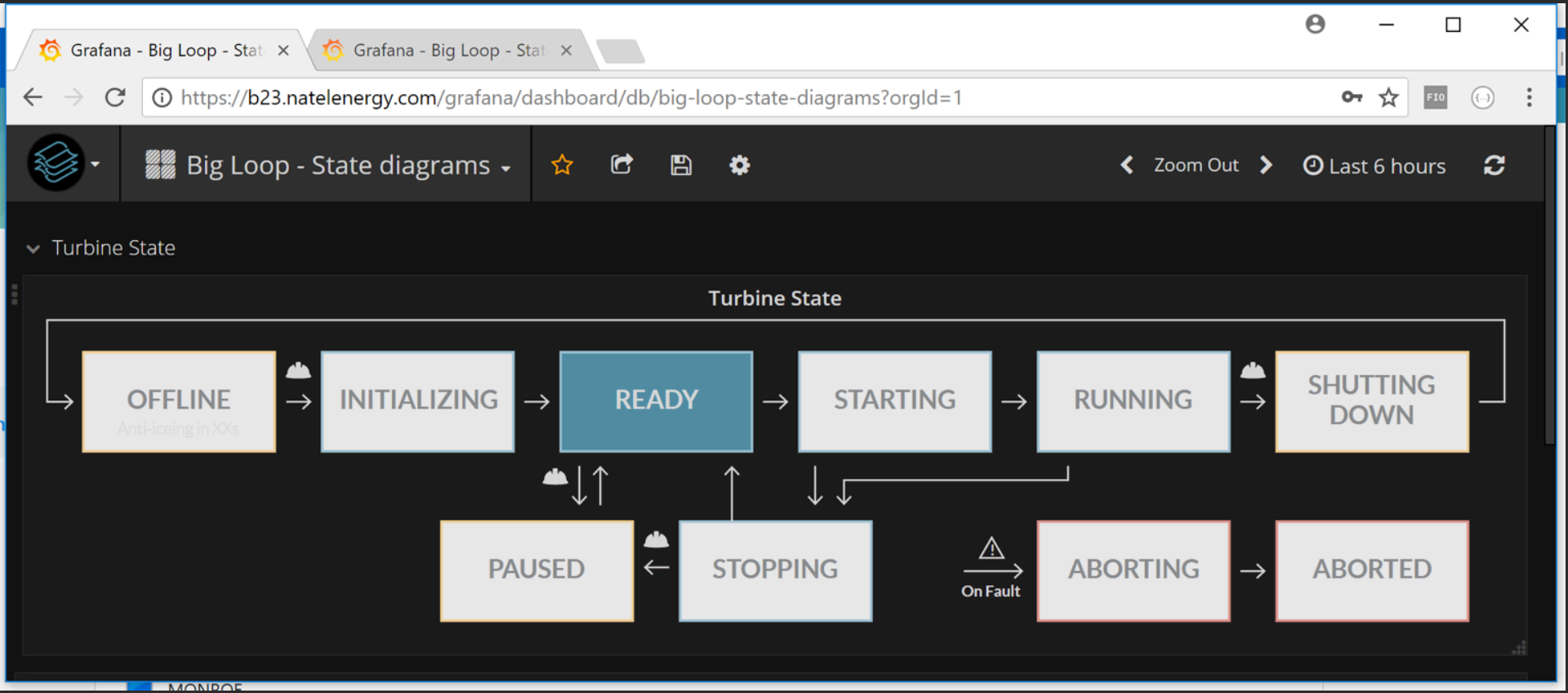
State Machines



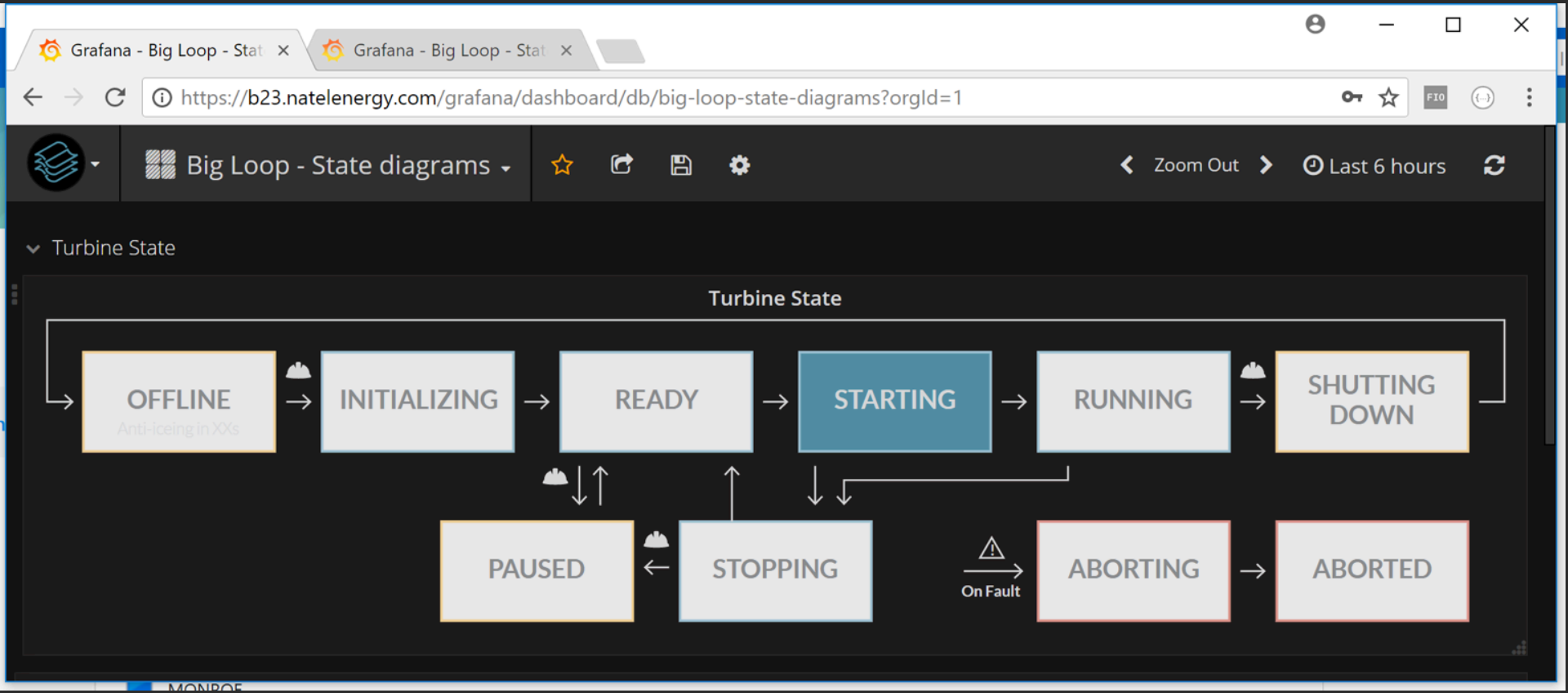
State Machines



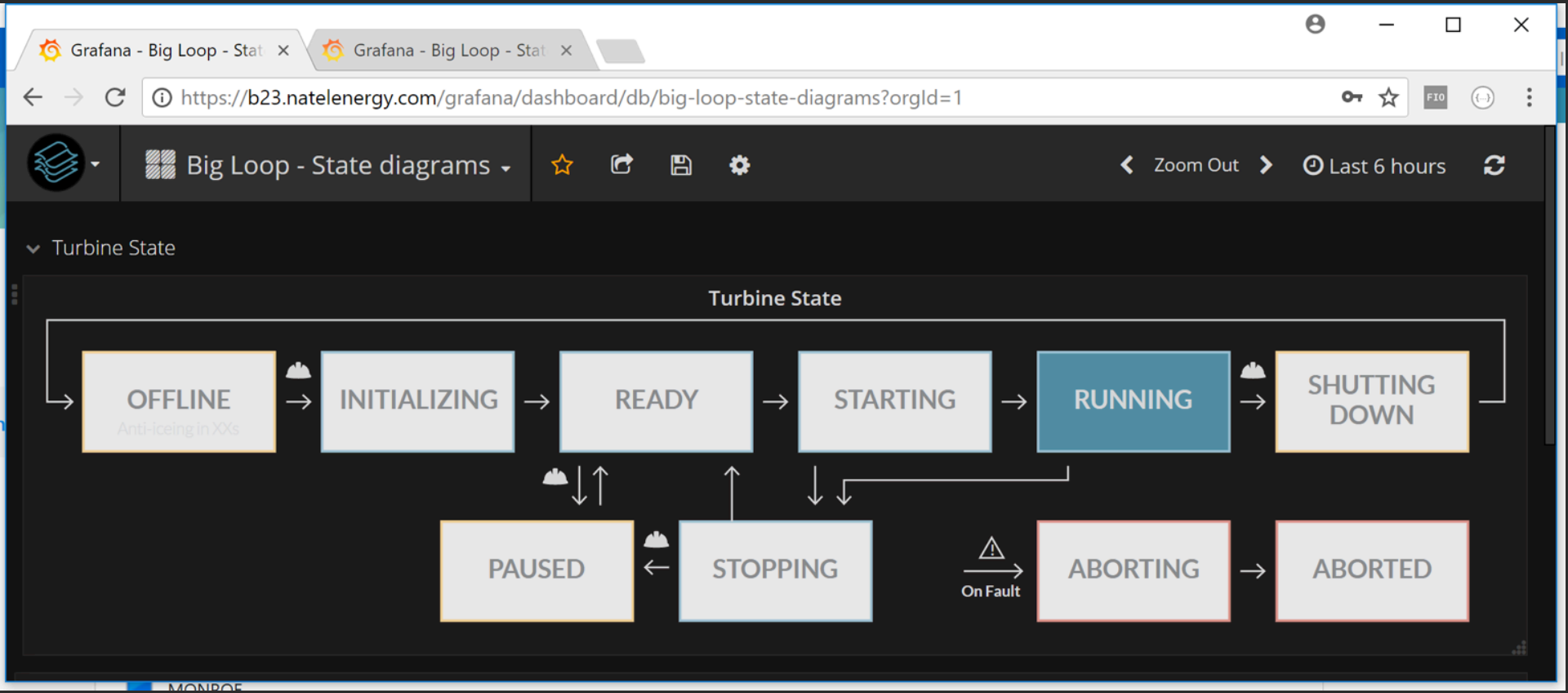
State Machines

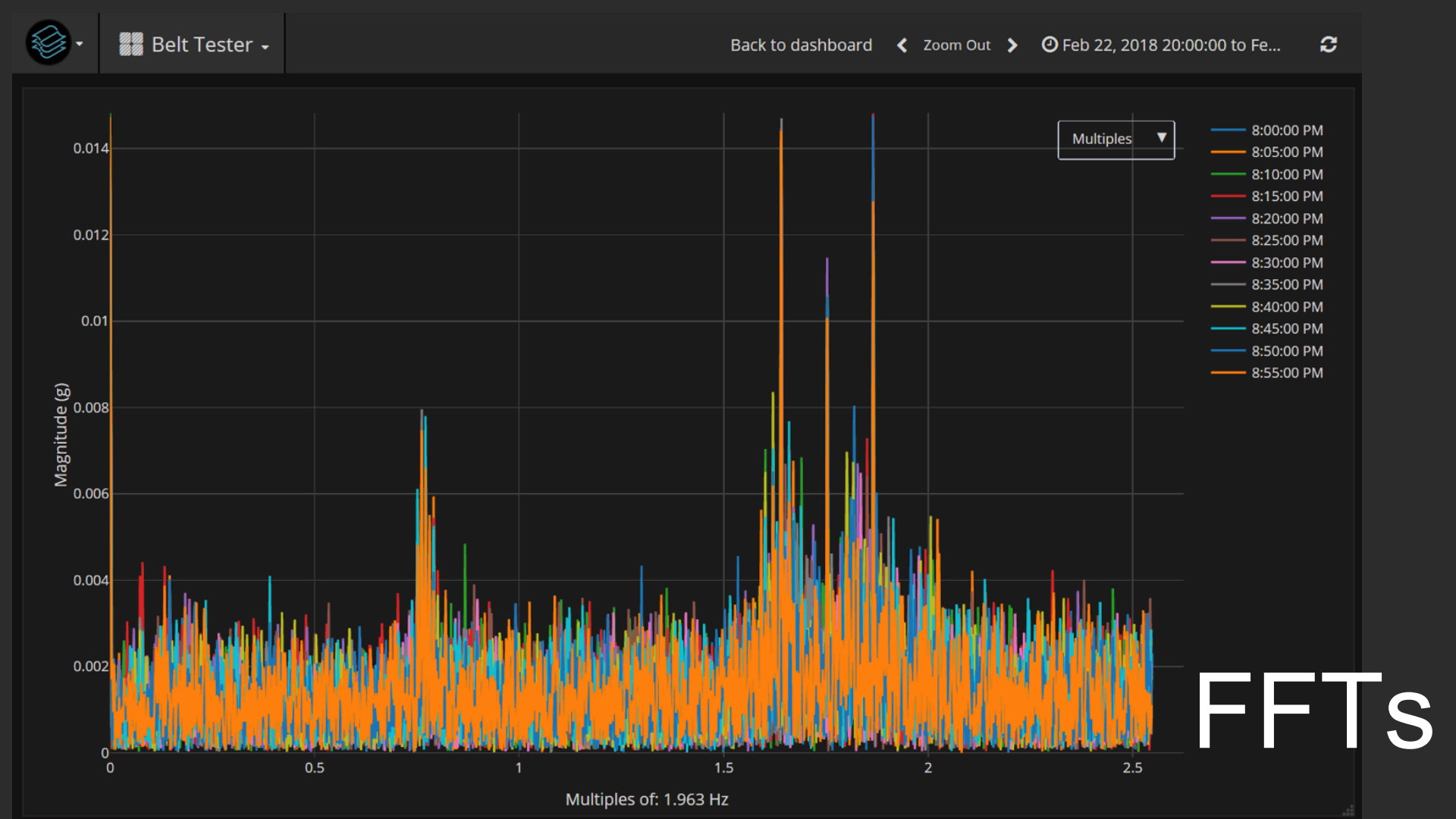


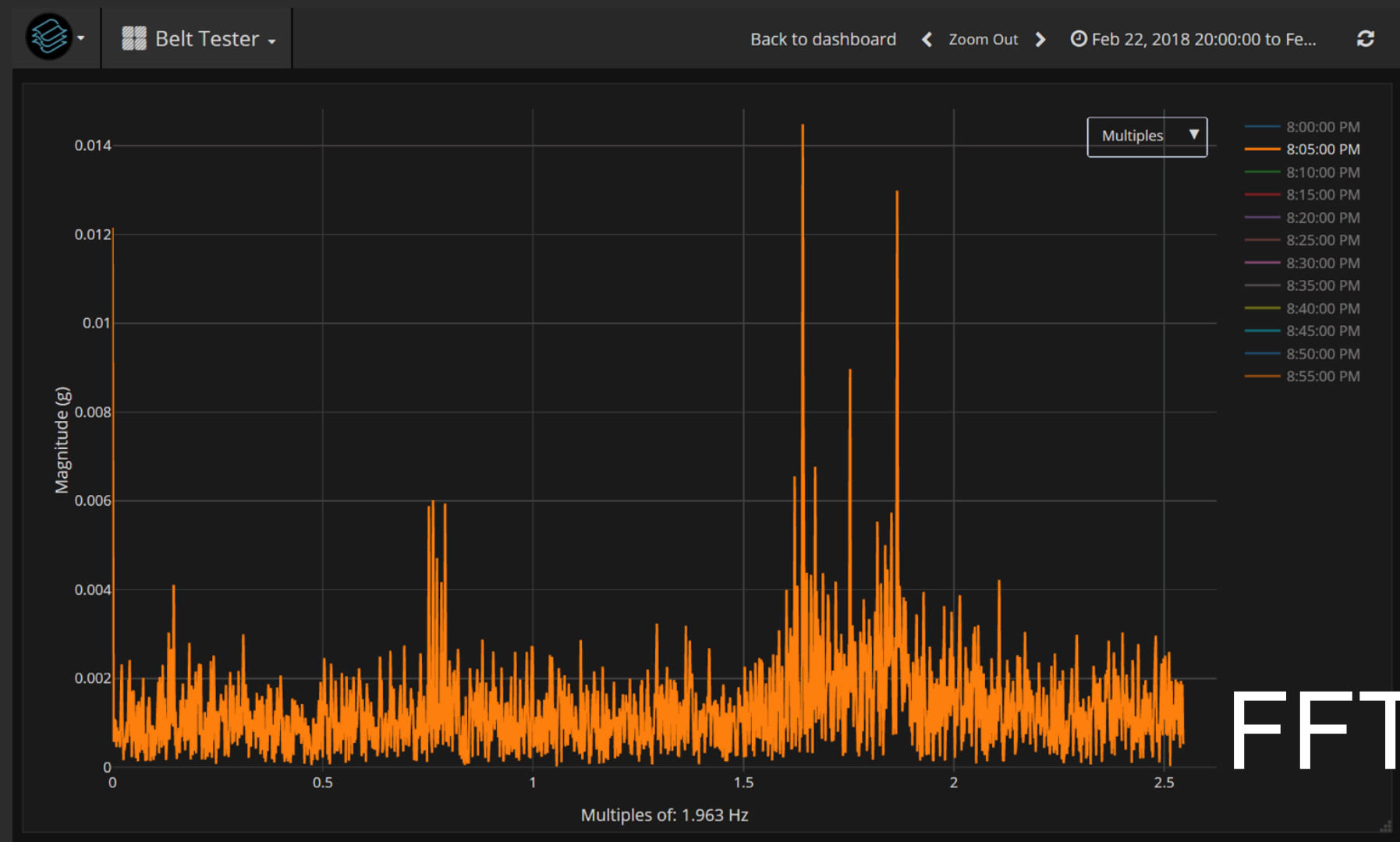
State Machines

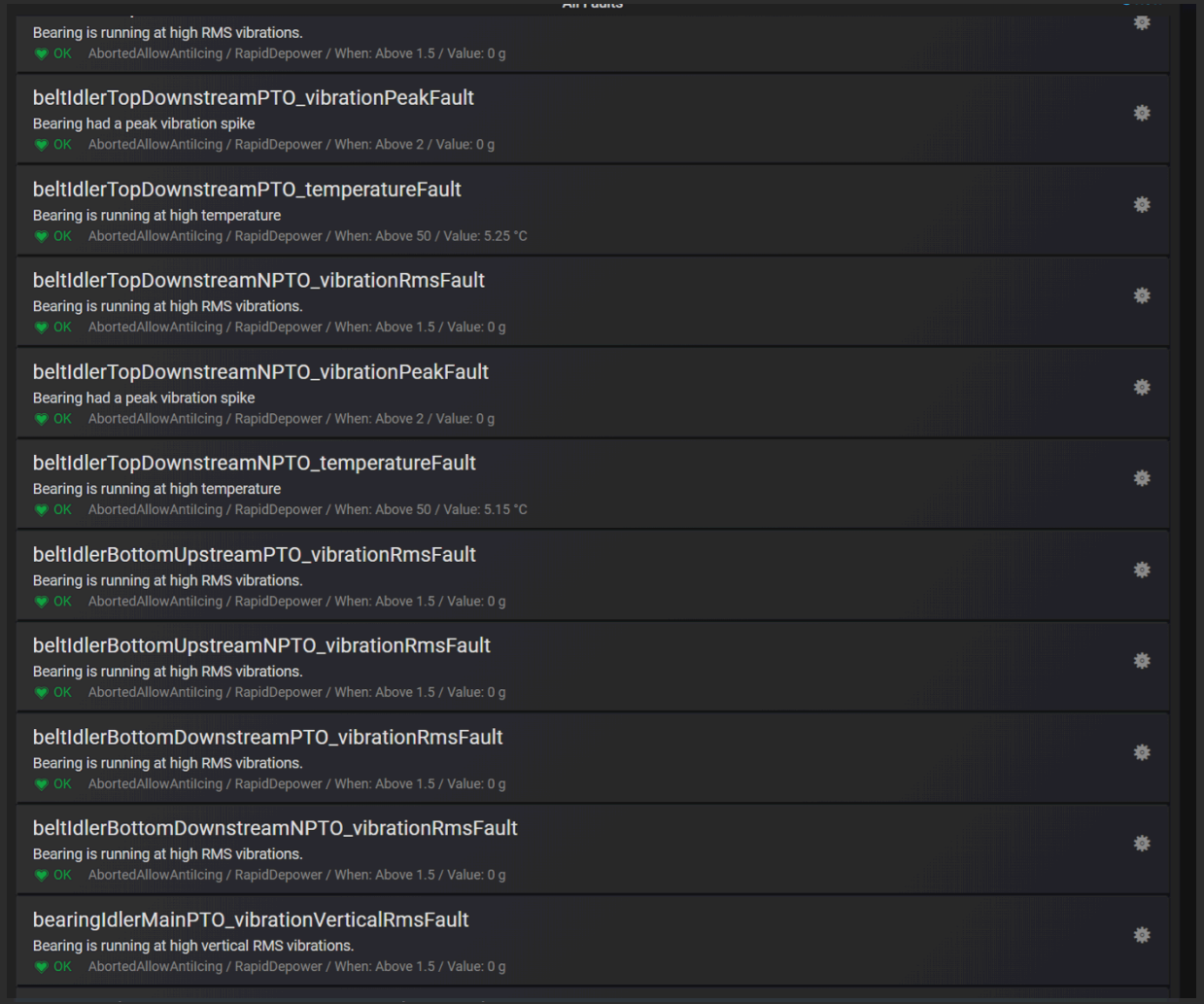


State Machines



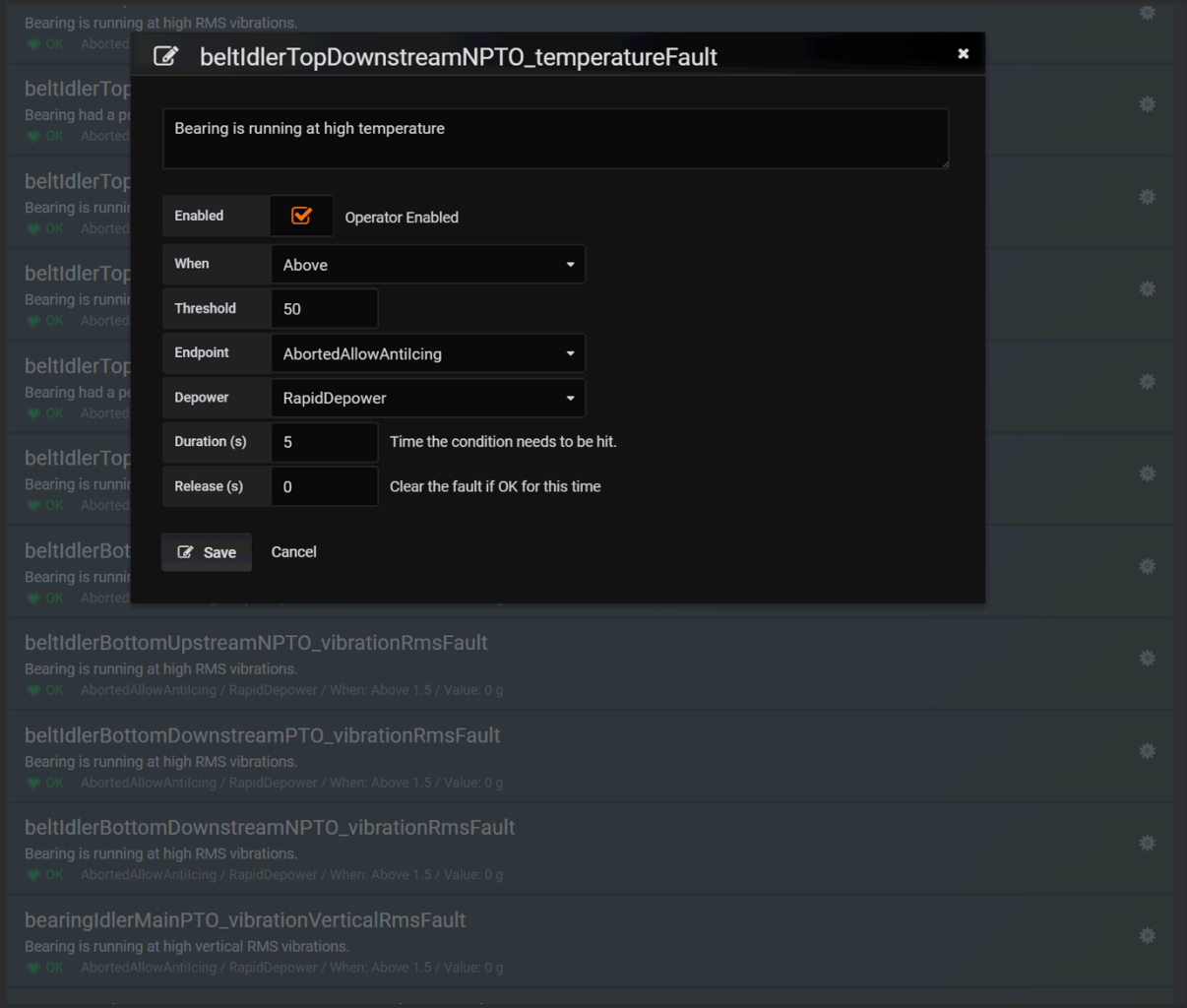

Belt Tester
Back to dashboard
Zoom Out
Feb 22, 2018 20:00:00 to Fe...
Multiples
8:00:00 PM
8:05:00 PM
8:10:00 PM
8:15:00 PM
8:20:00 PM
8:25:00 PM
8:30:00 PM
8:35:00 PM
8:40:00 PM
8:45:00 PM
8:50:00 PM
8:55:00 PM
Magnitude (g)
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
0
0.5
1
1.5
2
2.5
Multiples of: 1.963 Hz
FFTs


Belt Tester
Back to dashboard
Zoom Out
Feb 22, 2018 20:00:00 to Fe...
Multiples
8:00:00 PM
8:05:00 PM
8:10:00 PM
8:15:00 PM
8:20:00 PM
8:25:00 PM
8:30:00 PM
8:35:00 PM
8:40:00 PM
8:45:00 PM
8:50:00 PM
8:55:00 PM
Magnitude (g)
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
0
0.5
1
1.5
2
2.5
Multiples of: 1.963 Hz
FFTs


Bearing is running at high RMS vibrations.
OK AbortedAllowAntiIcing / RapidDepower / When: Above 1.5 / Value: 0 g
beltIdlerTopDownstreamPTO_vibrationPeakFault
Bearing had a peak vibration spike
OK AbortedAllowAntiIcing / RapidDepower / When: Above 2 / Value: 0 g
beltIdlerTopDownstreamPTO_temperatureFault
Bearing is running at high temperature
OK AbortedAllowAntiIcing / RapidDepower / When: Above 50 / Value: 5.25 °C
beltIdlerTopDownstreamNPTO_vibrationRmsFault
Bearing is running at high RMS vibrations.
OK AbortedAllowAntiIcing / RapidDepower / When: Above 1.5 / Value: 0 g
beltIdlerTopDownstreamNPTO_vibrationPeakFault
Bearing had a peak vibration spike
OK AbortedAllowAntiIcing / RapidDepower / When: Above 2 / Value: 0 g
beltIdlerTopDownstreamNPTO_temperatureFault
Bearing is running at high temperature
OK AbortedAllowAntiIcing / RapidDepower / When: Above 50 / Value: 5.15 °C
beltIdlerBottomUpstreamPTO_vibrationRmsFault
Bearing is running at high RMS vibrations.
OK AbortedAllowAntiIcing / RapidDepower / When: Above 1.5 / Value: 0 g
beltIdlerBottomUpstreamNPTO_vibrationRmsFault
Bearing is running at high RMS vibrations.
OK AbortedAllowAntiIcing / RapidDepower / When: Above 1.5 / Value: 0 g
beltIdlerBottomDownstreamPTO_vibrationRmsFault
Bearing is running at high RMS vibrations.
OK AbortedAllowAntiIcing / RapidDepower / When: Above 1.5 / Value: 0 g
beltIdlerBottomDownstreamNPTO_vibrationRmsFault
Bearing is running at high RMS vibrations.
OK AbortedAllowAntiIcing / RapidDepower / When: Above 1.5 / Value: 0 g
bearingIdlerMainPTO_vibrationVerticalRmsFault
Bearing is running at high vertical RMS vibrations.
OK AbortedAllowAntiIcing / RapidDepower / When: Above 1.5 / Value: 0 g

Faults

Faults


beltIdlerTopDownstreamNPTO_temperatureFault
Bearing is running at high temperature
Enabled
Operator Enabled
When
Above
Threshold
50
Endpoint
AbortedAllowAntiIcing
Depower
RapidDepower
Duration (s)
5
Time the condition needs to be hit.
Release (s)
0
Clear the fault if OK for this time
Save
Cancel
beltIdlerBottomUpstreamNPTO_vibrationRmsFault
Bearing is running at high RMS vibrations.
beltIdlerBottomDownstreamPTO_vibrationRmsFault
Bearing is running at high RMS vibrations.
beltIdlerBottomDownstreamNPTO_vibrationRmsFault
Bearing is running at high RMS vibrations.
bearingIdlerMainPTO_vibrationVerticalRmsFault
Bearing is running at high vertical RMS vibrations.

Faults

Plant Control

Current State	Aborted
Safe Start	Safe Start
Force Start	Force Start
Force Start	Stop

Pump Control

Request	0 rpm
Actual	0 rpm
MAX	600 rpm
Purging Speed	150 rpm
Turbine Head	-1 m

Turbine Control

Request	275 rpm
Actual	0 rpm
MAX	400 rpm
MIN	0 rpm
Gear Ratio	3.20

Nozzle Control (TODO)

Target %	100%
Current %	0%

System State

Energized	No Power
Loop	Aborted
PumpController	Aborted
TurbineSpeedController	Aborted

Live View

4:26:13 PM

Faults

NOW

turbine

32 OK 4 Disabled

plant

2 In Fault 12 OK 4 Not Evaluated 6 Disabled

RapidDepower / AbortedAllowAntiIcing (Current Behavior)

buttonPanels_turbineEstopFault

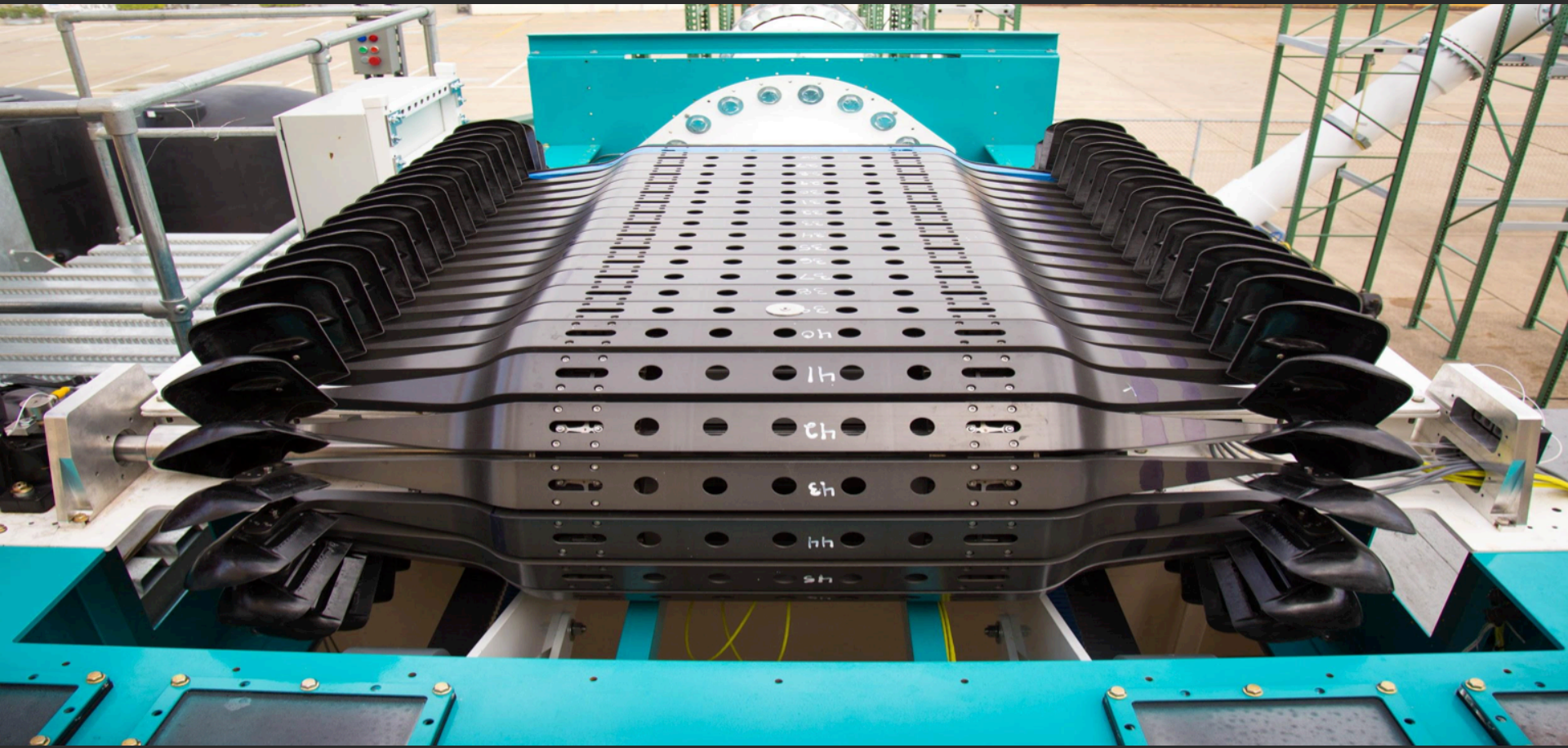
E-stop near the turbine was pressed.

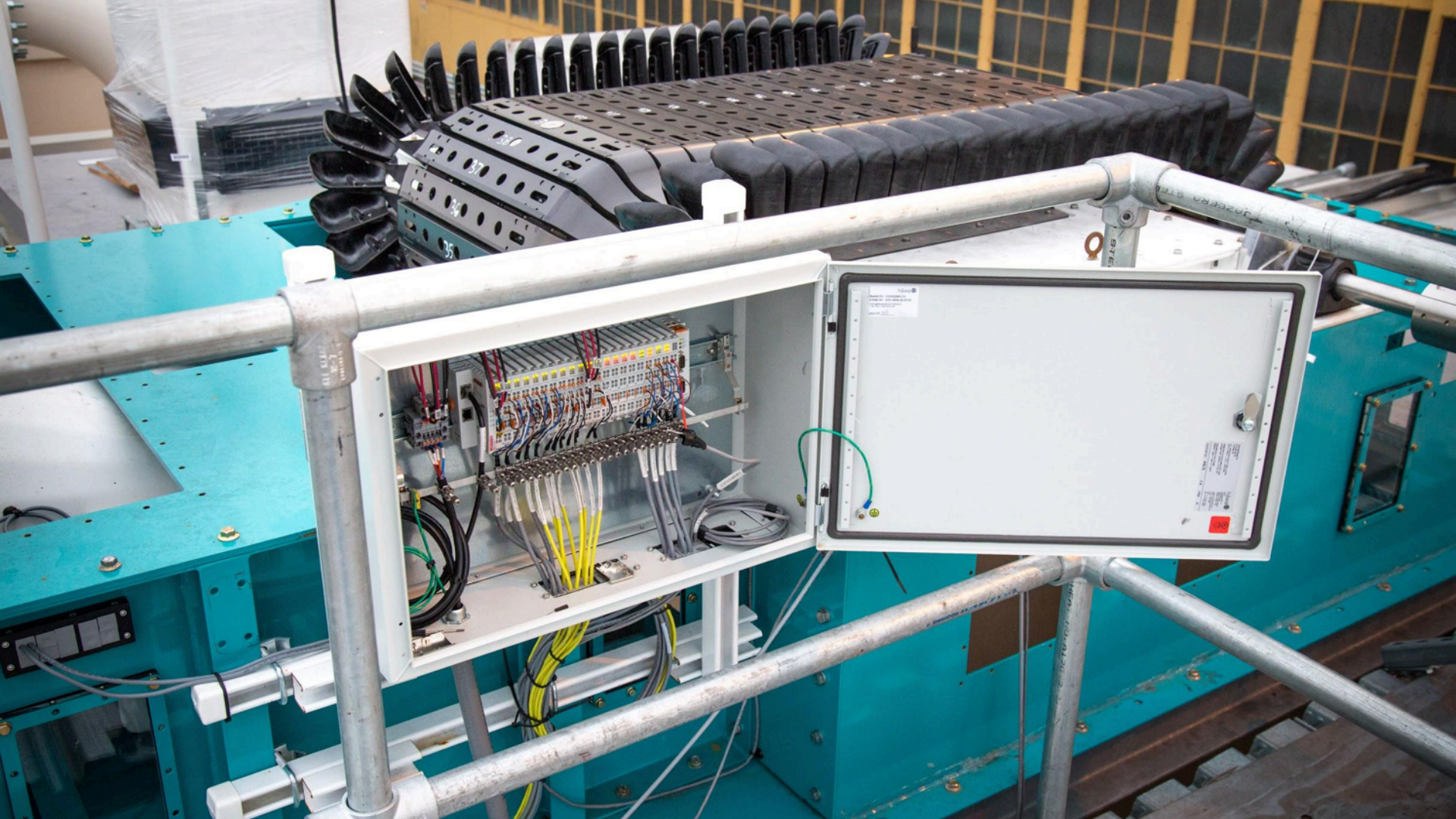
In Fault Since February 27, 2018 12:08 AM AbortedAllowAntiIcing / RapidDepower / When: False / Value: false

buttonPanels_controlRoomEstopFault

E-stop in control room was pressed

In Fault Since February 27, 2018 12:08 AM AbortedAllowAntiIcing / RapidDepower / When: False / Value: false





Currently Active Licenses (NX, etc)

note, the time query does not matter. These are the last known values

Request NX License

Optional Broadcast message

MILLFOUND | NX11110 | NX13300N — Click to request a license. This will log the request and broadcast a message to #nx_license

MILLFOUND

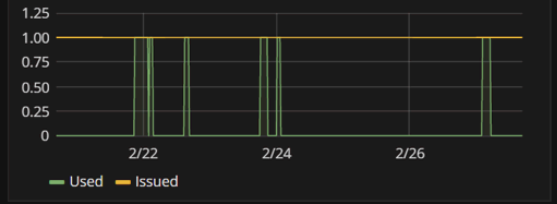
No data to show

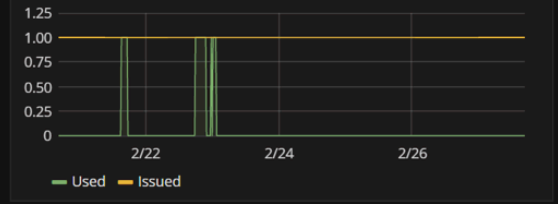
NX11110

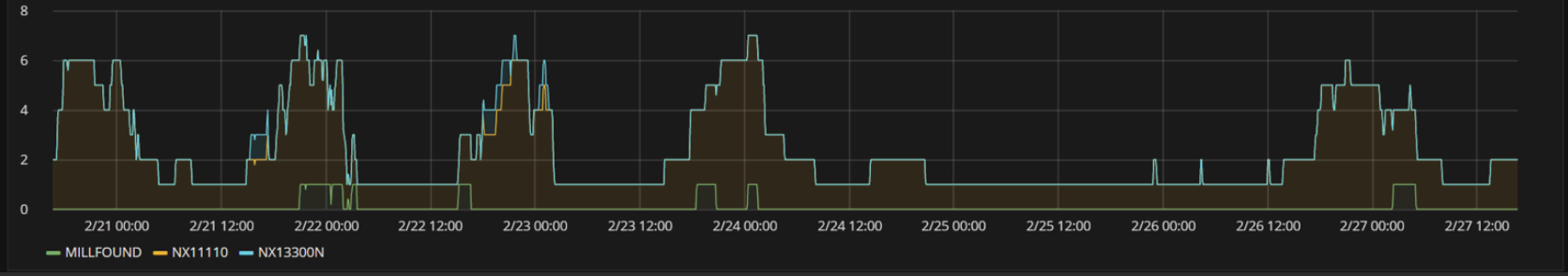
who	computer
rodrigo	natel-ral-p51
abe	natel-ads-p51

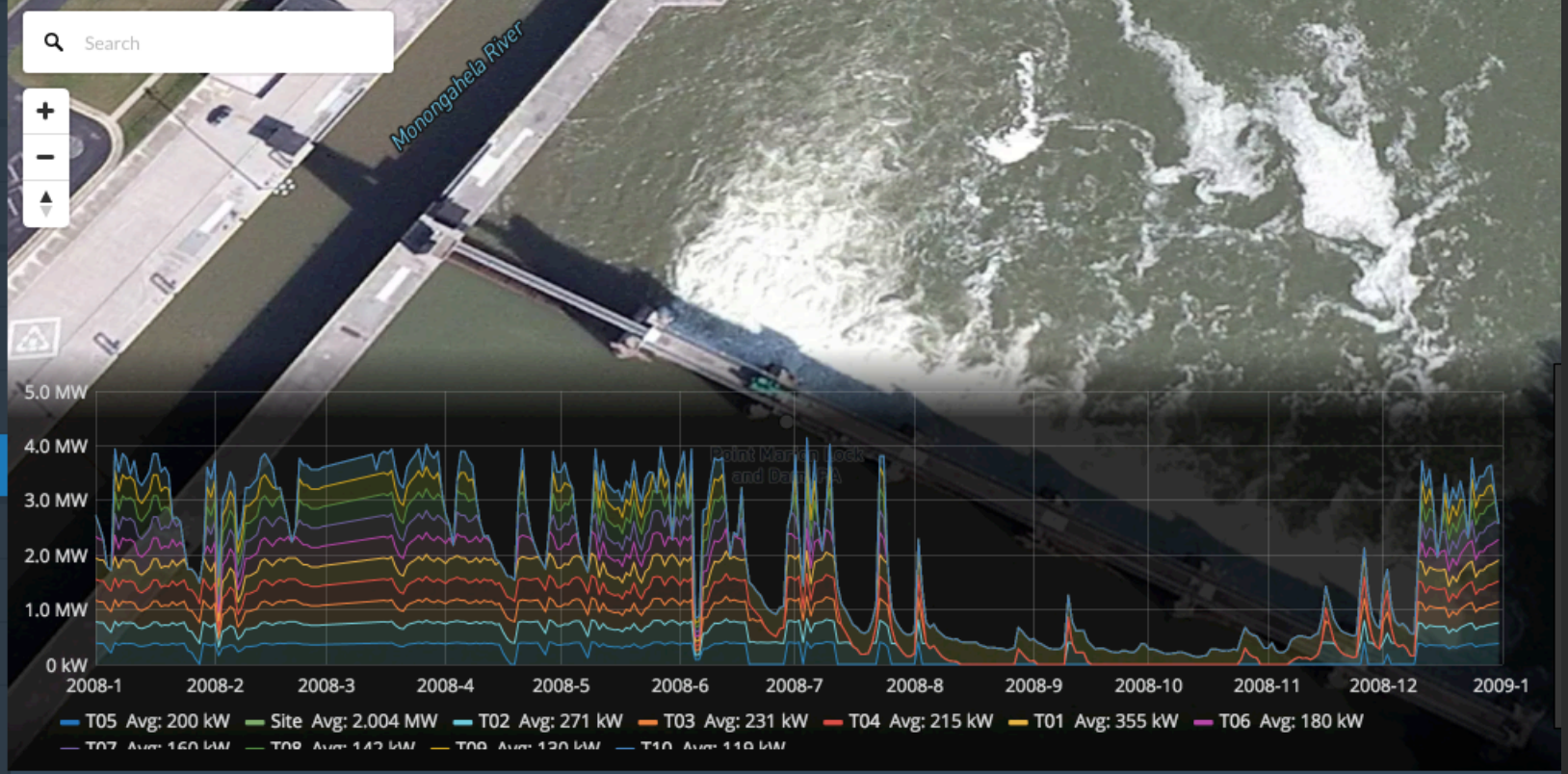
NX13300N

No data to show





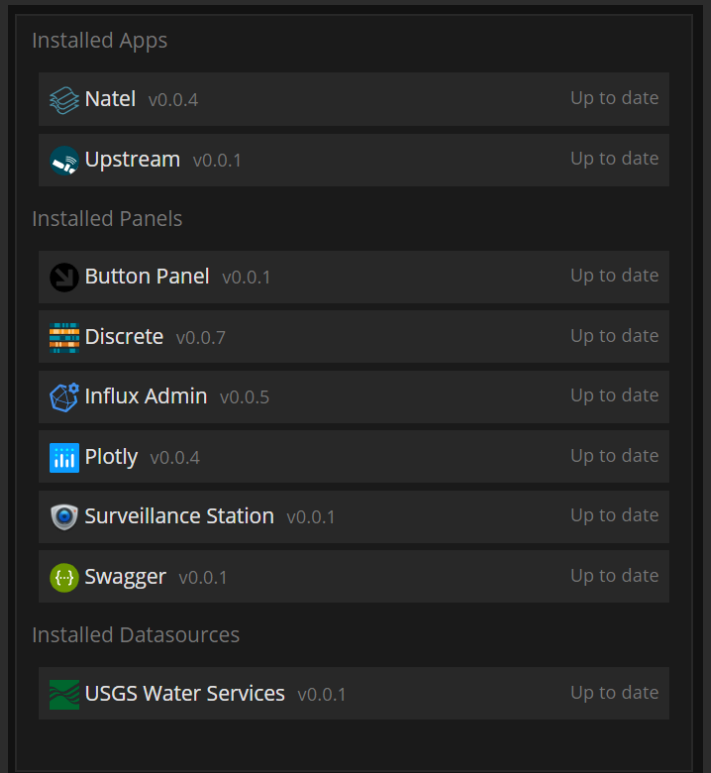


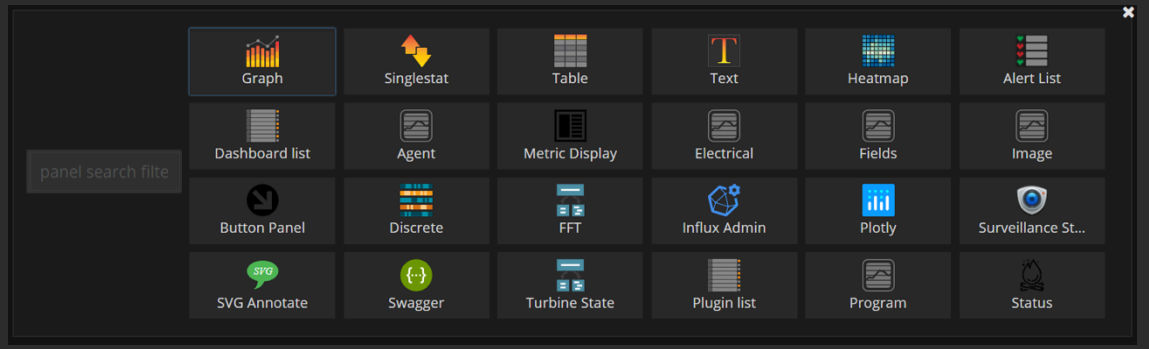


Filter...

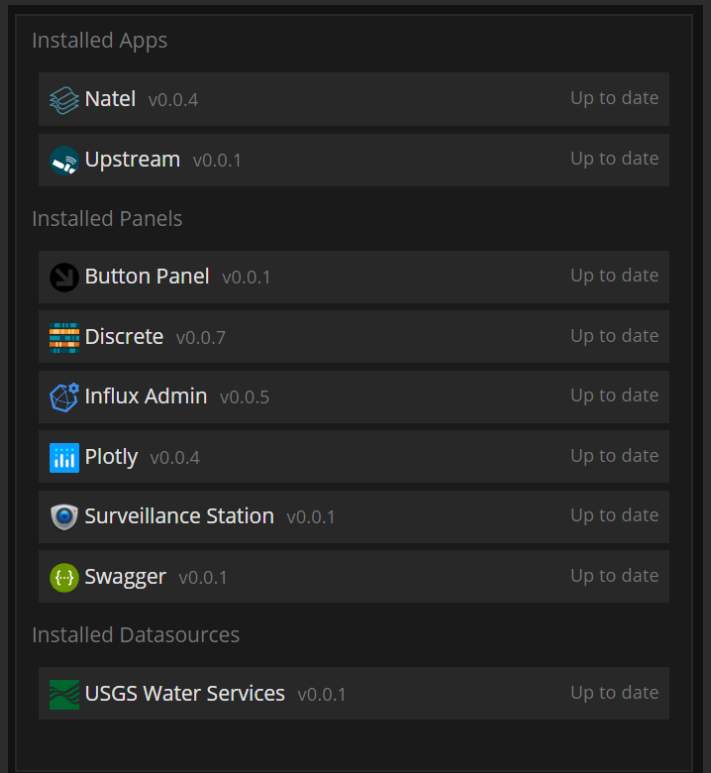
	Name	Status (CHOICE)	Type (CHOICE)	Head	Flow	Power	Energy
	Camiling RIS main cana...	NEW_SITE	IN_CANAL	6.01	11.31	500.11208325000007	0
	Point Marion Lock and ...	NEW_SITE	EXISTING_DAM	6	138.75	4765.811	16407.9554
	Opekiska Lock and Da...	NEW_SITE	EXISTING_DAM	6	151.92800000000003	5818.801	23176.0018

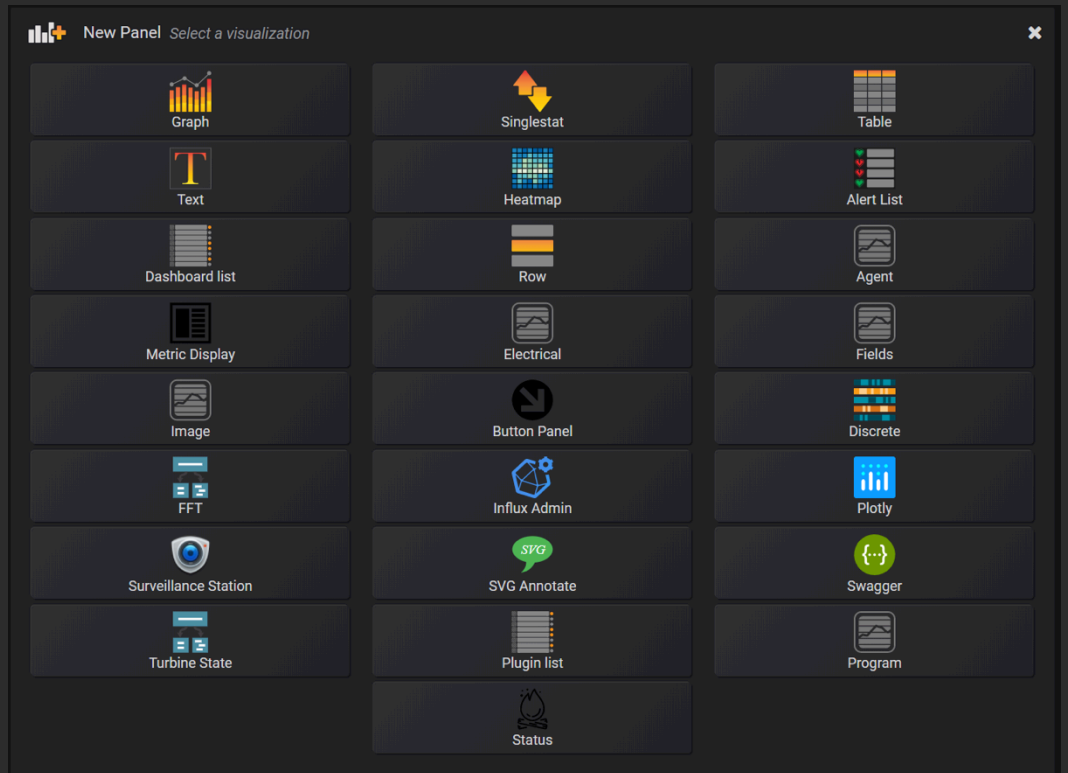
Plugins Plugins Plugins



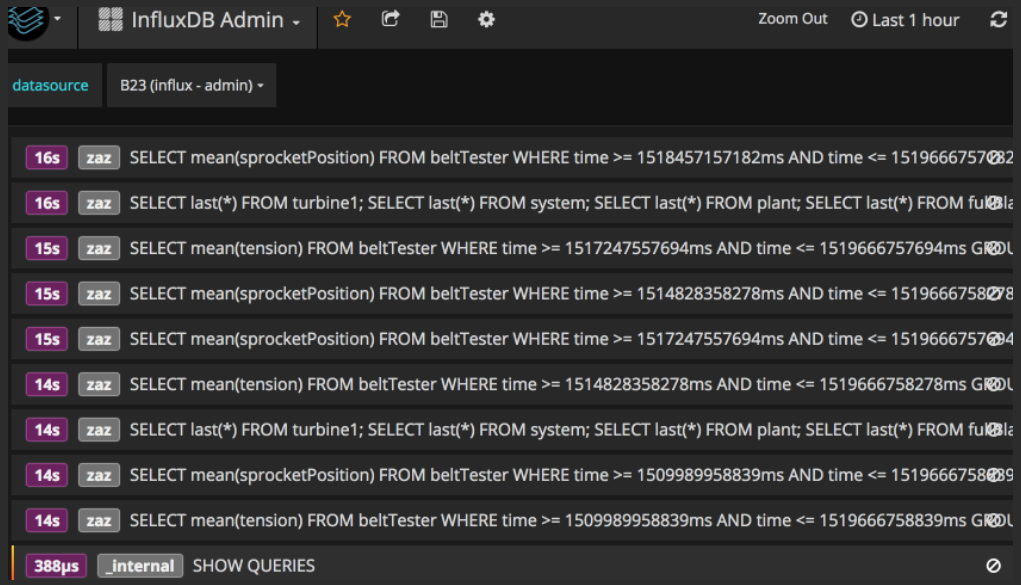


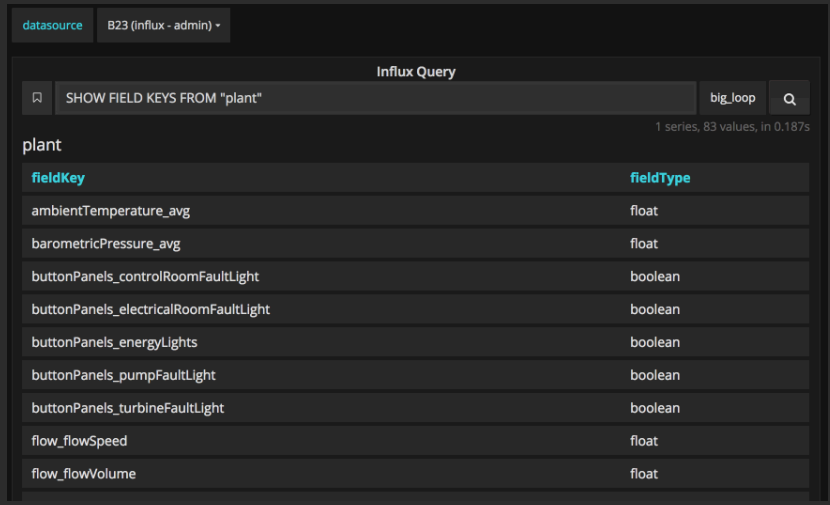
Plugins Plugins Plugins





Influx Admin





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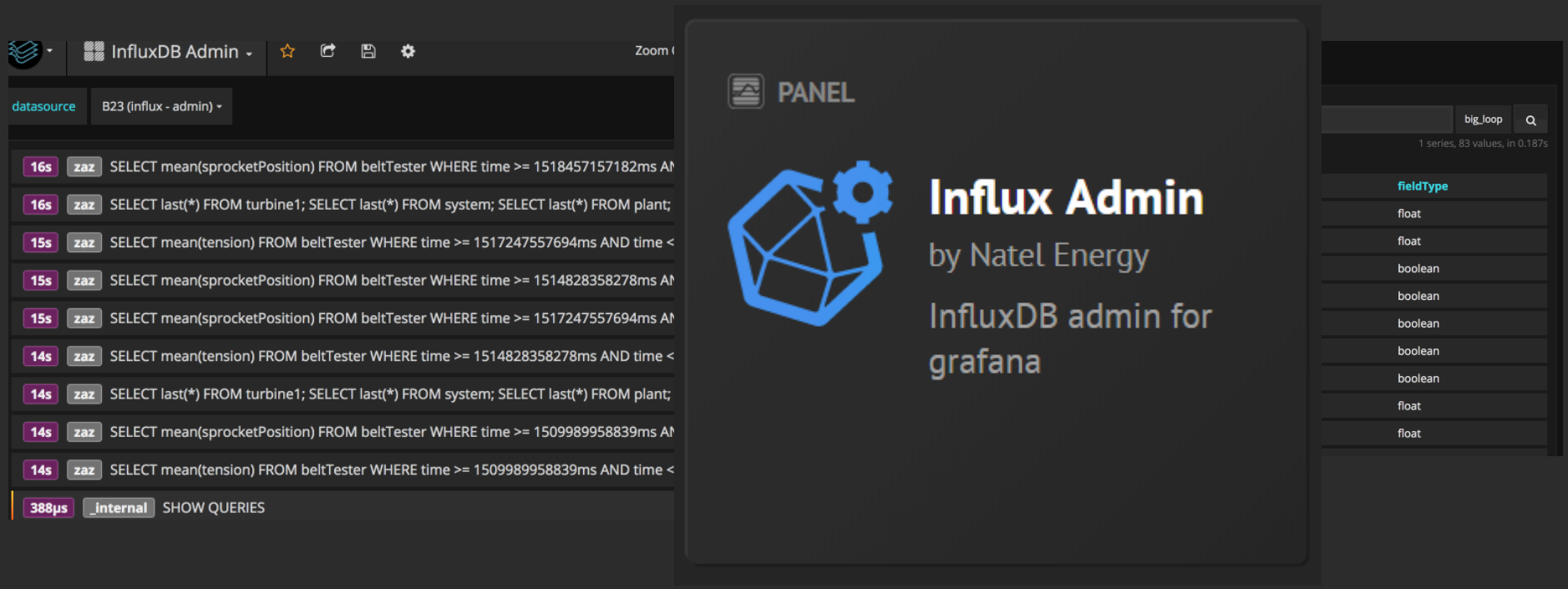
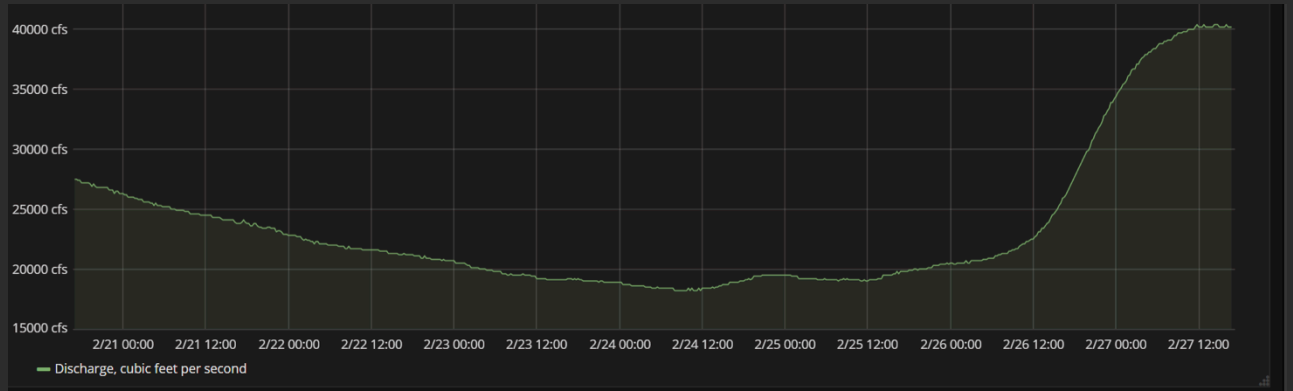
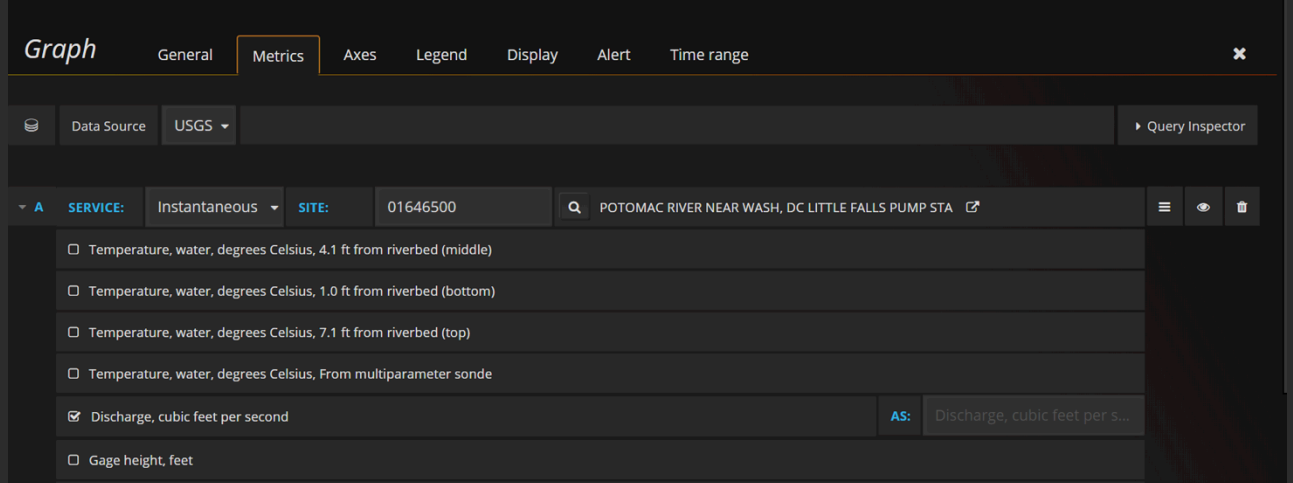
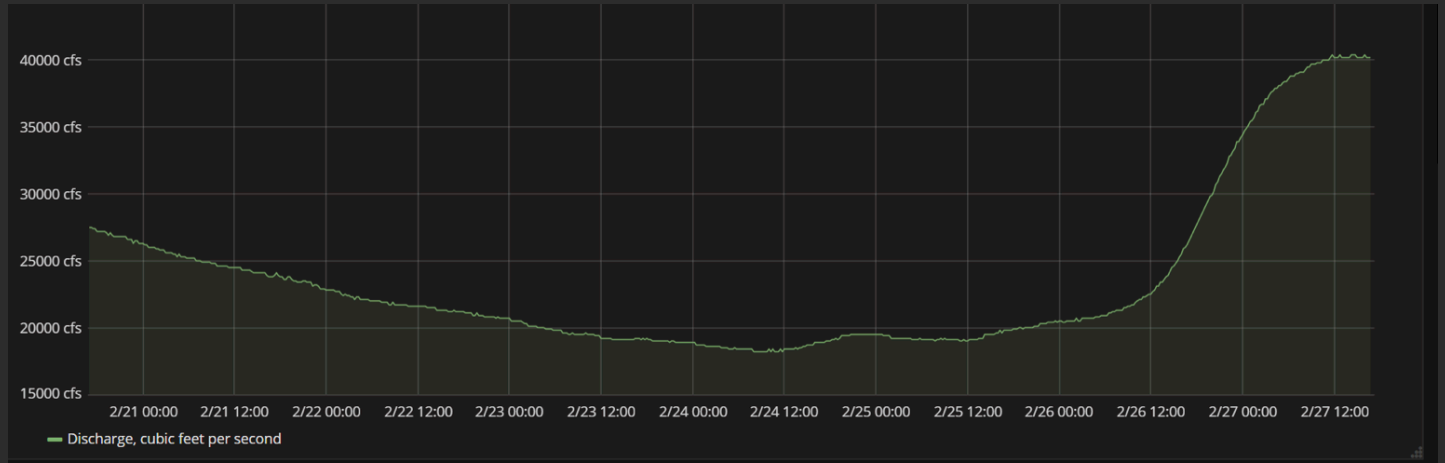


USGS Water Services





USGS Water Services



Graph | General | Metrics | Axes | Legend | Display | Alert | Time range

Data Source | USGS | Query Inspector

Mock Response | Expand All | Copy to Clipboard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▾request: Object
  method: "GET"
  url: "https://waterservices.usgs.gov/nwis/iv/service/?format=rdb&startDT=2018-02-20T15:47:00Z&sites=01646500&parameterCd=00060"
response: "# ---------- WARNING ---------- # Some of the data that you have obtained from this U.S. Geological Survey database may not # have received Director's approval. Any such data values are qualified as provisional and # are subject to revision. Provisional data are released on the condition that neither the # USGS nor the United States Government may be held liable for any damages resulting from its use. # Go to http://help.waterdata.usgs.gov/policies/provisional-data-statement for more information. # # File-format description: http://help.waterdata.usgs.gov/faq/about-tab-delimited-output # Automated-retrieval info: http://help.waterdata.usgs.gov/faq/automated-retrievals # # Contact: gs-w_support_nwisweb@usgs.gov # retrieved: 2018-02-27 11:17:24 -05:00 (natwebcaas01) # # Data for the following 1 site(s) are contained in this file # USGS 01646500 POTOMAC RIVER NEAR WASH, DC LITTLE FALLS PUMP STA # -------
```

Surveillance Station