



**Luminant**

# Thermal Performance Analysis using PI Asset Framework



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Principal Engineer



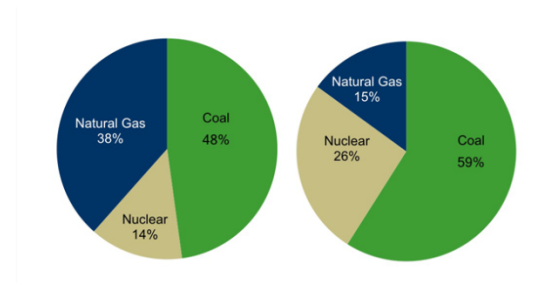
- Largest Generator in Texas – 17,814 MW
- 2018 – 180 MW Solar Plant
- 2018 – Retire 1,800 MW Coal Plant
- 2017 - 1,054 MW Combined Cycle Plant
- 2016 – 1,912 MW Combined Cycle Plant
- 2016 – 1,076 MW Combined Cycle Plant

## 2016 Generation Portfolio

Most of the energy Luminant generates is produced by its reliable, low-cost nuclear and coal plants.

**2016 Generating Capacity**  
Total: 16,760 MW

**2016 Energy Production<sup>1</sup>**  
Total: 77,574 GWh



Graphs illustrate 2016 only.

### Generation Summary

FUEL TYPE	CAPACITY (MW)	NUMBER OF PLANTS	NUMBER OF UNITS
Nuclear	2,300	1	2
Coal	8,017	5	12
Natural gas	7,497*	10*	42*
- Thermal	2,480	4	7
- Simple-Cycle	975	3	15
- Combined-Cycle	4,042	3	20
<b>TOTAL</b>	<sup>1</sup> 17,814	16	56

\*Includes all thermal, simple-cycle and combined-cycle units.



# Business Challenge

- Onboarding new generation assets
- Competitive electric market
- Distributed applications
  - 3 different thermal performance tools
  - 13 different applications
  - Each requires maintenance and expertise
- Challenged to consolidate thermal performance analysis
- Solution must be scalable and easy to maintain



# Templates

- Allow for scale
- Substitution Parameters are key

Library

- AF-Prod
  - Templates
    - Element Templates
      - CC - Block 2X1

Category: Element Calculation

	Cascade Flow to Heater	<code>\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1</code>
	Condensate Flow	<code>\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1</code>
	Degree of Sub-Cooling	<code>\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1</code>
	<b>Drain Cooler Approach (DCA)</b>	<code>\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1</code>
	Drain Enthalpy	<code>\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1</code>
	Drain Flow Out	<code>\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1</code>
	Drain Heat Duty	<code>\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1</code>
	External Drain Cooler Drain Cooler Approach (DCA)	<code>\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1</code>

NUC - Main Feed Pump

- NUC - Moisture Separator Reheater
- NUC - Reactor
- NUC - Steam Generator
- NUC - Steam Generator Blowdown Heat Exchanger
- NUC - Turbine

Event Frame Templates

Model Templates

Transfer Templates

Enumeration Sets

```
\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1
```



# Templates

- 24 elements from 1 Template
- Substitution Parameters create PI Tags

Category: Element Calculation		
	Cascade Flow to Heater	\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1
	Condensate Flow	\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1
	Degree of Sub-Cooling	\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1
	Drain Cooler Approach (DCA)	\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1
	Drain Enthalpy	\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1
	Drain Flow Out	\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1
	Drain Heat Duty	\\pocpi\AF_%Element%_%Attribute%;pointtype=Float64;displaydigits=1

Category: Element Calculation			
		Cascade Flow to Heater	\\pocpi\AF_CP2_Feedwater Heater 1A_Cascade Flow to Heater
		Condensate Flow	\\pocpi\AF_CP2_Feedwater Heater 1A_Condensate Flow
		Degree of Sub-Cooling	\\pocpi\AF_CP2_Feedwater Heater 1A_Degree of Sub-Cooling
		Drain Cooler Approach (DCA)	\\pocpi\AF_CP2_Feedwater Heater 1A_Drain Cooler Approach (DCA)
		Drain Enthalpy	\\pocpi\AF_CP2_Feedwater Heater 1A_Drain Enthalpy
		Drain Flow Out	\\pocpi\AF_CP2_Feedwater Heater 1A_Drain Flow Out
		Drain Heat Duty	\\pocpi\AF_CP2_Feedwater Heater 1A_Drain Heat Duty

CP1\_Steam Generator  
CP1\_Steam Generator Blowdown Heat Exchanger  
CP1\_Turbine

CP2\_Steam Generator  
CP2\_Steam Generator Blowdown Heat Exchanger  
CP2\_Turbine

Feedwater Inlet Press...  
Feedwater Outlet Pre...  
salpy  
thalpy  
Pure Rise (Trise)



# Templates

- Substitution Parameters create attribute references

Category: Process Points

Ambient Temperature	..\\ %.. Element%_Attribute%
Atmospheric Pressure	..\\ %.. Element%_Attribute%
Condensate Cooling Flow to Steam Generator Blowdown Heat Exchanger	..\\ %.. Element%_Attribute%
Condensate Pump Discharge Flow	..\\ %.. Element%_Attribute%
Condensate Pump Discharge Pressure	..\\ %.. Element%_Attribute%
Condensate Pump Discharge Temperature	..\\ %.. Element%_Attribute%
Drain Temperature	..\\ %.. Element%_Attribute%
External Drain Cooler Drain Temperature	..\\ %.. Element%_Attribute%
External Drain Cooler Inlet Temperature	..\\ %.. Element%_Attribute%
Extraction Steam Temperature	..\\ %.. Element%_Attribute%

Leading Edge Flow Meter (LEFM) Flow		0	<None>	PI Point	..\\ %.. Element%_Attribute%
Leading Edge Flow Meter (LEFM) Temperature		0 °F	degree Fahrenheit	PI Point	..\\ %.. Element%_Attribute%
Main Feed Pump A Discharge Pressure	Feedwater pressure	0 psig	rel. pound-force per s...	PI Point	..\\ %.. Element%_Attribute%
Main Feed Pump A Suction Flow		0 gpm	Gallons per minute	PI Point	..\\ %.. Element%_Attribute%
Main Feed Pump A Suction Pressure		0 psig	rel. pound-force per s...	PI Point	..\\ %.. Element%_Attribute%
Main Feed Pump B Discharge Pressure	Feedwater pressure	0 psig	rel. pound-force per s...	PI Point	..\\ %.. Element%_Attribute%
Main Feed Pump B Suction Flow		0 gpm	Gallons per minute	PI Point	..\\ %.. Element%_Attribute%
Main Feed Pump B Suction Pressure		0 psig	rel. pound-force per s...	PI Point	..\\ %.. Element%_Attribute%
Outlet Temperature	Feedwater Outlet	0 °F	degree Fahrenheit	PI Point	..\\ %.. Element%_Attribute%
Shell Steam Pressure		0 psia	pound-force per squar...	PI Point	..\\ %.. Element%_Attribute%

# Templates

- Attributes references are managed at the asset level

The screenshot displays a software interface for managing asset attributes. The main window shows a table of attributes for the asset 'CP2\_Feedwater Heater 1A'. The table has columns for Name, Value, Unit of Measure, and Settings. A red circle highlights the 'Atmospheric Pressure' row, which has a value of 14.7 and a unit of 'psia'. The table also shows other attributes like 'Drain Temperature', 'Inlet Temperature', and 'Outlet Temperature'. The interface includes a tree view on the left showing the asset hierarchy and a bottom panel with additional asset details.

Name	Value	Unit of Measure	Settings...
Category: Feedwater Heaters			
Drain Temperature	415.590484619141	degree Fahrenheit	..\ CP2_Feedwater Heater 1A_Drain Temperature
Inlet Temperature	404.221405029297	degree Fahrenheit	..\ CP2_Feedwater Heater 1A_Inlet Temperature
Outlet Temperature	445.525054931641	degree Fahrenheit	..\ CP2_Feedwater Heater 1A_Outlet Temperature
Shell Steam Pressure	427.237030029297	pound-force per square inch (abs...)	..\ CP2_Feedwater Heater 1A_Shell Steam Pressure
Category: Process Points			
Category: Process Points			
2nd Pass Tube Outlet Temperature			..\ CP2_Moisture Separator Reheater A_2nd Pass Tube Outlet Temperature
Ambient Temperature			..\ CP2_Ambient Temperature
Atmospheric Pressure			..\ CP2_Atmospheric Pressure
Condensate Cooling Flow to Steam Generator Blowdown Heat Exchanger			..\ CP2_Condensate Cooling Flow to Steam Generator Blowdown Heat Exchanger
Condensate Pump_Discharge Flow			..\ CP2_Condensate Pump_Discharge Flow
Condensate Pump_Discharge Pressure			..\ CP2_Condensate Pump_Discharge Pressure
Condensate Pump_Discharge Temperature			..\ CP2_Condensate Pump_Discharge Temperature
Drain Temperature			..\ CP2_Feedwater Heater 1A_Drain Temperature
Category: Process Points			
Leading Edge Flow Meter (LEFM) Flow	16.291418075561523	<None>	..\ CP2_Leading Edge Flow Meter (LEFM) Flow
Leading Edge Flow Meter (LEFM) Temperature	445.700042724609	degree Fahrenheit	..\ CP2_Leading Edge Flow Meter (LEFM) Temperature
Main Feed Pump A_Discharge Pressure	1219.80822753906	rel. pound-force per square inch	..\ CP2_Main Feed Pump A_Discharge Pressure
Main Feed Pump A_Suction Flow	18151.689453125	Gallons per minute	..\ CP2_Main Feed Pump A_Suction Flow
Main Feed Pump A_Suction Pressure	354.637512207031	rel. pound-force per square inch	..\ CP2_Main Feed Pump A_Suction Pressure
Main Feed Pump B_Discharge Pressure	1217.80749511719	rel. pound-force per square inch	..\ CP2_Main Feed Pump B_Discharge Pressure
Main Feed Pump B_Suction Flow	18517.380859375	Gallons per minute	..\ CP2_Main Feed Pump B_Suction Flow
Main Feed Pump B_Suction Pressure	354.305847167969	rel. pound-force per square inch	..\ CP2_Main Feed Pump B_Suction Pressure
Outlet Temperature	445.525054931641	degree Fahrenheit	..\ CP2_Feedwater Heater 1A_Outlet Temperature
Reheater Drain Tank 1 Pressure	866.0843	rel. pound-force per square inch	..\ CP2_Moisture Separator Reheater A_Reheater Drain Tank 1 Pressure



# Templates

- PI tag references are managed at the unit level

Name	Value	Settings...
CP2_Feedwater Heater 6B_Outlet Temperature	146.750823974609 °F	\\usocptxpipvw01\U2_T2555A01
CP2_Feedwater Heater 6B_Shell Steam Pressure	3.62372303009033 psia	\\usocptxpipvw01\U2_P2251A01
Category: Process Points		
CP2_Ambient Temperature	54.228199005127 °F	\\usocptxpipvw01\U2_T6027A
CP2_Atmospheric Pressure	29.4029006958008 inHg	\\usocptxpipvw01\U2_P0700A
CP2_Auxillary Condenser A_Condenser Outlet Temperature	104.37523651123 °F	\\usocptxpipvw01\U2_T2406A01
CP2_Auxillary Condenser A_Condenser Shell Pressure	26.7104454040527 inHg	\\usocptxpipvw01\U2_P3000A
CP2_Auxillary Condenser B_Condenser Outlet Temperature	104.731369018555 °F	\\usocptxpipvw01\U2_T2407A01
CP2_Auxillary Condenser B_Condenser Shell Pressure	26.7141952514648 inHg	\\usocptxpipvw01\U2_P3001A

Tag Name	Value	Units	Settings
CP2_Condensate Pump_Discharge Temperature	114.097183227539 °F	degree Fahrenheit	\\usocptbpipvw01\U2_T2541A
CP2_Condenser A_Circulating Water Inlet Temperature	88.9994277954102 °F	degree Fahrenheit	\\usocptbpipvw01\U2_T2400A
CP2_Condenser A_Circulating Water Outlet Temperature 1	104.887168884277 °F	degree Fahrenheit	\\usocptbpipvw01\U2_T2402A
CP2_Condenser A_Circulating Water Outlet Temperature 2	105.121025085449 °F	degree Fahrenheit	\\usocptbpipvw01\U2_T2403A
CP2_Condenser A_Condenser Air In Leakage	PI Point not found \U2_CH...	cubic foot per minute	\\usocptbpipvw01\U2_CH1047A
CP2_Condenser A_Condenser Hotwell Level	3.06559562683105 ft	foot	\\usocptbpipvw01\U2_L2501A
CP2_Condenser A_Condenser Hotwell Temperature	115.066818237305 °F	degree Fahrenheit	\\usocptbpipvw01\U2_T5510A
CP2_Condenser A_Condenser Shell Pressure	26.3534774780273 inHg	inches of mercury	\\usocptbpipvw01\U2_P6600A01
CP2_Condenser A_Exhaust Hood Temperature 1	115.2665 °F	degree Fahrenheit	\\usocptbpipvw01\U2_T5530A01
CP2_Condenser A_Exhaust Hood Temperature 2	115.0785 °F	degree Fahrenheit	\\usocptbpipvw01\U2_T5531A01





# Analysis Templates

- Allow for scale
- Backfill Sequence established
- Calculations are converted from Excel worksheets

Library | Nuc - Feedwater Heater

Example Element: [CP2\CP2\\_Feedwater Heater 1A](#)

Name	Expression	Value at Evaluation	Value at Last Trigg	Output Attribute
C30	'Leading Edge Flow Meter (LEFM) Flow'*1000	16277	16277	<a href="#">Map</a>
C21	convert('Heater Drain Pump_Discharge Temperature','°C')	181.07 °C	181.07 °C	<a href="#">Map</a>
C18	Convert(Convert(avg('Main Feed Pump A_Suction Pressure','Main Feed Pump B_:	2549.3 kPa	2549.3 kPa	<a href="#">Map</a>
C31	Steam_VPTL(C18,C21)	1.1275 cm3/g	1.1275 cm3/g	<a href="#">Map</a>
C31Eng	c31*0.0160185	0.018062	0.018062	<a href="#">Map</a>
C20	'Heater Drain Pump_Discharge Flow'	13697 gpm	13577 gpm	<a href="#">Map</a>
C32	//HD Pump Disch Flow - klb/hr C20*0.13368*1/C31Eng*60/1000	6082.7	6029.2	<a href="#">Heater Drain Pump Flow</a>
C33	//Condensate Flow (per LEFM Flow) - klb/hr C30-C32	10194	10248	<a href="#">Condensate Flow</a>



# Analysis Templates

- Analysis is running
- Backfill Complete

		Name	Schedule	Output(s)	Backfilling
✓		f00 00BF - Cascade Enthalpy to Heater	Natural	Cascade Flow Enthalpy	✓
✓		f00 01BF - Cascade Steam Flow	Frequency=300	Cascade Flow to Heater	✓
✓		f00 01BF - Condensate-Feedwater Flow	Frequency=300	Heater Drain Pump Flow; Co...	✓
✓		f00 01BF - Degree of Sub-Cooling	Frequency=300	Degree of Sub-Cooling	✓
✓		f00 01BF - Drain Cooler Approach - Internal	Frequency=300	Drain Cooler Approach (DCA)	✓
✓		f00 01BF - Extraction Steam Enthalpy	Frequency=300	Extraction Steam Enthalpy	✓
✓		f00 01BF - Feedwater Pressure	Frequency=300	Heater Feedwater Inlet Press...	✓
✓		f00 01BF - Terminal Temperature Difference (TTD)	Frequency=300	Terminal Temperature Differ...	✓
✓		f00 01BF - Trise	Frequency=300	Temperature Rise (Trise)	✓
✓		f00 02BF - Drain Flow Enthalpy	Frequency=300	Drain Enthalpy	✓
✓		f00 02BF - Feedwater Enthalpy	Frequency=300	Inlet Enthalpy; Outlet Enthal...	✓
✓		f00 03BF - Drain Heat Duty	Frequency=300	Drain Heat Duty	✓
✓		f00 03BF - Feedwater Heat Duty	Frequency=300	Heater Feedwater Heat Duty	✓
✓		f00 04BF - Extraction Steam Flow	Frequency=300	Extraction Steam Flow	✓
✓		f00 05BF - Drain Flow	Frequency=300	Drain Flow Out	✓
⊘		f00 15BF - External Drain Cooler	Frequency=300	External Drain Cooler Inlet E...	



# Flat Hierarchy – Unit Level

- Easy Maintenance
- Description references DCS or PI Server
- Naming Convention is important

CP2

General Child Elements Attributes Ports Analyses Notification Rules Version

Filter

Name	Description	Settings...
Category: Bearing Vibration		
Category: Feedwater Heaters		
Category: Process Points		
CP2_Ambient Temperature	AMBIENT TEMP PRIMARY 10M(U2_T6027A)	\\uscopbxpipvw01\U2_T6027A
CP2_Atmospheric Pressure	BAROMETRIC PRESS(U2_P0700A)	\\uscopbxpipvw01\U2_P0700A
CP2_Auxiliary Condenser A_Condenser Outlet Temperature	AUX CNDSR A OUT TEMP-1M(U2_T2406A01)	\\uscopbxpipvw01\U2_T2406A01
CP2_Auxiliary Condenser A_Condenser Shell Pressure	AUX CNDSR A PRESS(U2_P3000A)	\\uscopbxpipvw01\U2_P3000A
CP2_Auxiliary Condenser B_Condenser Outlet Temperature	AUX CNDSR B OUT TEMP-1M(U2_T2407A01)	\\uscopbxpipvw01\U2_T2407A01
CP2_Auxiliary Condenser B_Condenser Shell Pressure	AUX CNDSR B PRESS(U2_P3001A)	\\uscopbxpipvw01\U2_P3001A
CP2_Circulating Water Pump 1_Motor Status	CWP 1 BKR(U2_Y6581D)	\\uscopbxpipvw01\U2_Y6581D

Tree View:

- CP2\_Feedwater Heater 6A
- CP2\_Feedwater Heater 6B
- CP2\_Main Feed Pump A
- CP2\_Main Feed Pump B
- CP2\_Moisture Separator Reheater A
- CP2\_Moisture Separator Reheater B
- CP2\_Reactor
- CP2\_Steam Generator
- CP2\_Steam Generator Blowdown Heat Exchange
- CP2\_Turbine

CP2_Condenser A_Condenser Air In Leakage	PI Point not found U2_CH10...	COND AIM IN-LEAK FLOW RATE(U2_CH1047A)	cubic foot per minute	\\uscopbxpipvw01\U2_CH1047A
CP2_Condenser A_Condenser Hotwell Level	3.07439970970154 ft	CNDR HOTWELL LV(U2_L2501A)	foot	\\uscopbxpipvw01\U2_L2501A
CP2_Condenser A_Condenser Hotwell Temperature	115.225715637207 °F	CNDR MAIN COND OUT TEMP(U2_T5510A)	degree Fahrenheit	\\uscopbxpipvw01\U2_T5510A
CP2_Condenser A_Condenser Shell Pressure	26.3043632507324 inHg	CNDR A PRESS (VA) - 1M(U2_P6600A01)	inches of mercury	\\uscopbxpipvw01\U2_P6600A01
CP2_Condenser A_Exhaust Hood Temperature 1	115.4507 °F	MAIN CNDSR A1 SHELL TEMP-1M(U2_T5530A01)	degree Fahrenheit	\\uscopbxpipvw01\U2_T5530A01
CP2_Condenser A_Exhaust Hood Temperature 2	115.2617 °F	MAIN CNDSR A2 SHELL TEMP-1M(U2_T5531A01)	degree Fahrenheit	\\uscopbxpipvw01\U2_T5531A01
CP2_Condenser B_Circulating Water Inlet Temperature	89.6784409086914 °F	CNDR B CWS B-1 IN TEMP(U2_T2401A)	degree Fahrenheit	\\uscopbxpipvw01\U2_T2401A
CP2_Condenser B_Circulating Water Outlet Temperature 1	105.027565002441 °F	CNDR B CWS B-3 OUT TEMP(U2_T2404A)	degree Fahrenheit	\\uscopbxpipvw01\U2_T2404A
CP2_Condenser B_Circulating Water Outlet Temperature 2	105.023765563965 °F	CNDR B CWS B-4 OUT TEMP(U2_T2405A)	degree Fahrenheit	\\uscopbxpipvw01\U2_T2405A



# Flat Hierarchy – Asset Level

- Attributes reference to main level
- Naming Convention is important

The screenshot shows a software interface for 'Nuc - Feedwater Heater'. It features a tabbed menu with 'General', 'Attribute Templates', 'Ports', 'Analysis Templates', and 'Notification Rule Templates'. Below the menu is a 'Filter' section and a table of attributes. The 'Atmospheric Pressure' row is circled in red. The table columns include Name, Settings, and a reference path.

Name	Settings...
Terminal Temperature Difference (TTD)	\\pocpi\AF_%Element%_%Attribute%;
Category: Element Calculation Reference	
Cascade Flow	..\\ %Element%_%Attribute%
Cascade Flow Enthalpy	..\\ %Element%_%Attribute%
Category: Feedwater Heaters	
Category: Process Points	
Ambient Temperature	\\ %@unit%_%Attribute%
<b>Atmospheric Pressure</b>	..\\ %.. Element%_%Attribute%
Condensate Cooling Flow to Steam Generator Sim	..\\ %.. Element%_%Attribute%
Condensate Pump_Discharge Flow	..\\ %.. Element%_%Attribute%
Condensate Pump_Discharge Pressure	..\\ %.. Element%_%Attribute%



# PI Vision

- Element Relative Display
- One display multiple assets
- Asset Comparison Table

Asset	Inlet Temperature	Outlet Temperature	Drain Temperature	Shell Steam Pressure
CP2_Feedwater Heater 1A	404.0	445.5	415.8	427.2
CP2_Feedwater Heater 1B	403.0	446.1	414.3	424.6
CP2_Feedwater Heater 2A	358.2	404.0	367.5	280.0
CP2_Feedwater Heater 2B	358.2	403.0	367.7	275.0
CP2_Feedwater Heater 3A	275.1	355.7	357.6	154.9
CP2_Feedwater Heater 3B	275.1	355.4	356.1	153.3
CP2_Feedwater Heater 4A	218.1	275.1	227.8	48.5
CP2_Feedwater Heater 4B	218.9	275.1	229.3	51.1
CP2_Feedwater Heater 5A	146.4	219.2	156.9	18.23
CP2_Feedwater Heater 5B	146.8	220.3	158.8	18.53
CP2_Feedwater Heater 6A	120.5	146.4	148.7	3.65
CP2_Feedwater Heater 6B	120.5	146.8	149.2	3.63

CP2\_Feedwater Heater 3A

Asset	Inlet Temperature	Outlet Temperature	Drain Temperature	Shell Steam Pressure
CP2_Feedwater Heater 1B	403.0	446.1	414.3	424.6
CP2_Feedwater Heater 2A	358.2	404.0	367.5	280.0
CP2_Feedwater Heater 2B	358.2	403.0	367.8	275.1
CP2_Feedwater Heater 3A	275.2	355.6	357.6	154.9
CP2_Feedwater Heater 3B	275.2	355.3	356.2	153.3
CP2_Feedwater Heater 4A	218.1	275.2	227.7	48.5
CP2_Feedwater Heater 4B	219.0	275.2	229.2	51.1
CP2_Feedwater Heater 5A	146.5	219.3	157.0	18.23
CP2_Feedwater Heater 5B	146.9	220.4	158.9	18.54
CP2_Feedwater Heater 6A	120.5	146.5	148.7	3.65
CP2_Feedwater Heater 6B	120.5	146.9	149.2	3.63

External Drain Cooler (If Applicable)

CP2_Feedwater Heater 1A External Drain Cooler Inlet Temperature	0 °F
CP2_Feedwater Heater 1A External Drain Cooler Drain Temperature	0 °F
CP2_Feedwater Heater 1A External Drain Cooler Temperature Rise	0 °F
CP2_Feedwater Heater 1A External Drain Cooler Drain Cooler Approach	0 delta °F



# PI Vision

- Switch between assets

The screenshot displays the PI Vision interface for 'CP2\_Feedwater Heater 1A'. The left sidebar shows a tree view of assets under 'CP2', with 'CP2\_Feedwater Heater 1A' selected. The main area shows a 3D model of the heater and a data table. A 'Switch Asset' dropdown menu is open, listing various heaters from 'CP2\_Feedwater Heater 1A' to 'CP2\_Feedwater Heater 3B'. The data table below shows inlet and outlet temperatures for several heaters.

Asset	Inlet Temperature	Outlet
CP2_Feedwater Heater 1A	459.0	
CP2_Feedwater Heater 1B	459.0	
CP2_Feedwater Heater 2A	358.2	
CP2_Feedwater Heater 2B	358.2	
CP2_Feedwater Heater 3A	275.1	
CP2_Feedwater Heater 3B	275.2	
CP2_Feedwater Heater 4A	219.0	
CP2_Feedwater Heater 4B	219.0	
CP2_Feedwater Heater 5A	149.4	
CP2_Feedwater Heater 5B	149.4	
CP2_Feedwater Heater 6A	120.5	
CP2_Feedwater Heater 6B	120.5	



# Lessons Learned

- AF Kickstart session is very helpful
- Templates allow for scale
- Substitution parameters are key
- Hierarchy is important for maintenance
- Naming convention is important for Vision
- Backfill sequence needs to be noted
- Asset interdependence needs to be known

# Thermal Performance using PI Asset Framework



**Luminant**

## COMPANY and GOAL

Luminant wanted to leverage PI Asset Framework to perform thermal performance analysis of its generation fleet

## CHALLENGE

Thermal performance had traditionally been performed with a 3<sup>rd</sup> party application.

- Cost to implement 3<sup>rd</sup> party applications have historically been \$100K+ per unit
- Luminant resources were required to implement and maintain 3<sup>rd</sup> party applications

## SOLUTION

Build out thermal calculations in PI asset framework

- Element templates were utilized to standardize across fleet
- Substitution parameters were utilized to scale the application
- Flat Hierarchy was utilized to simplify maintenance

## RESULTS

Thermal performance calculations for Luminant's generation fleet can now be performed utilizing PI AF.

- PI AF was used on Luminant's most recent combined cycle unit saving \$160K.
- Standardization across the fleet allows for 1 system vs. 13 separate 3<sup>rd</sup> party applications.





# Contact Information

**Chris Jackson**

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Principal Engineer

Luminant Energy



## Questions

Please wait for the **microphone** before asking your questions



State your **name & company**

## Please don't forget to...

complete the Post  
Event Survey



감사합니다

谢谢

Danke

Merci

Gracias

**Thank You**

ありがとう

Спасибо

Obrigado

