Retrofitting Aging Plants with Wireless Instruments at Nova Scotia Power

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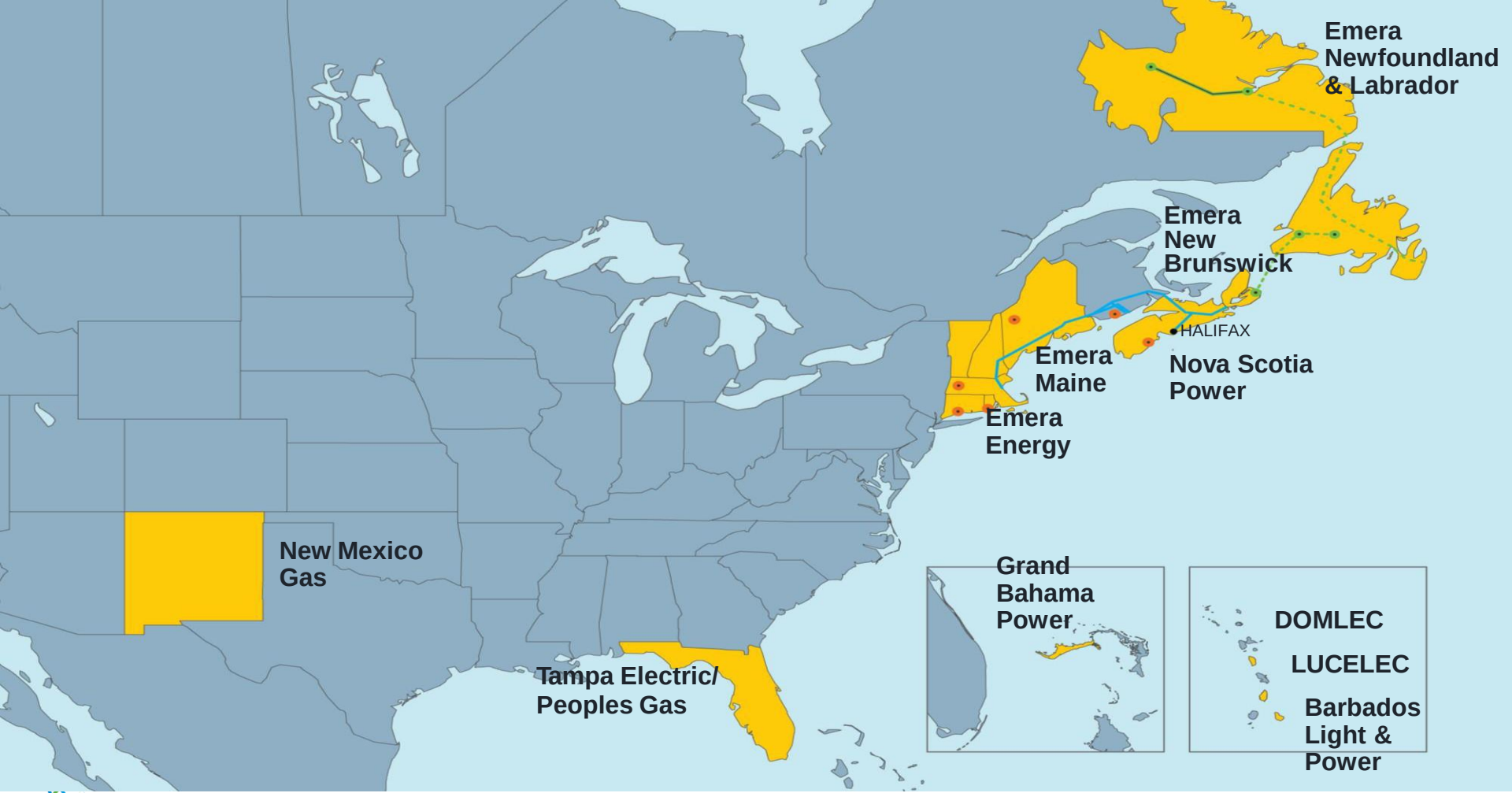
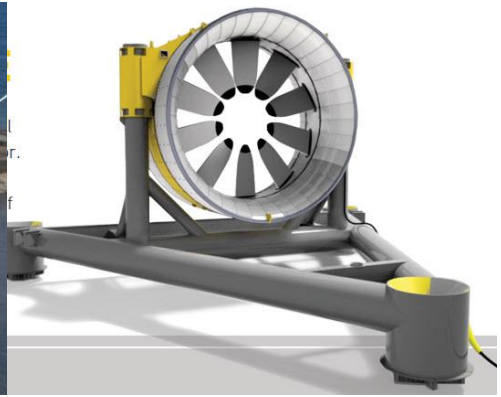
Nova Scotia Power

Conference Theme & Keywords



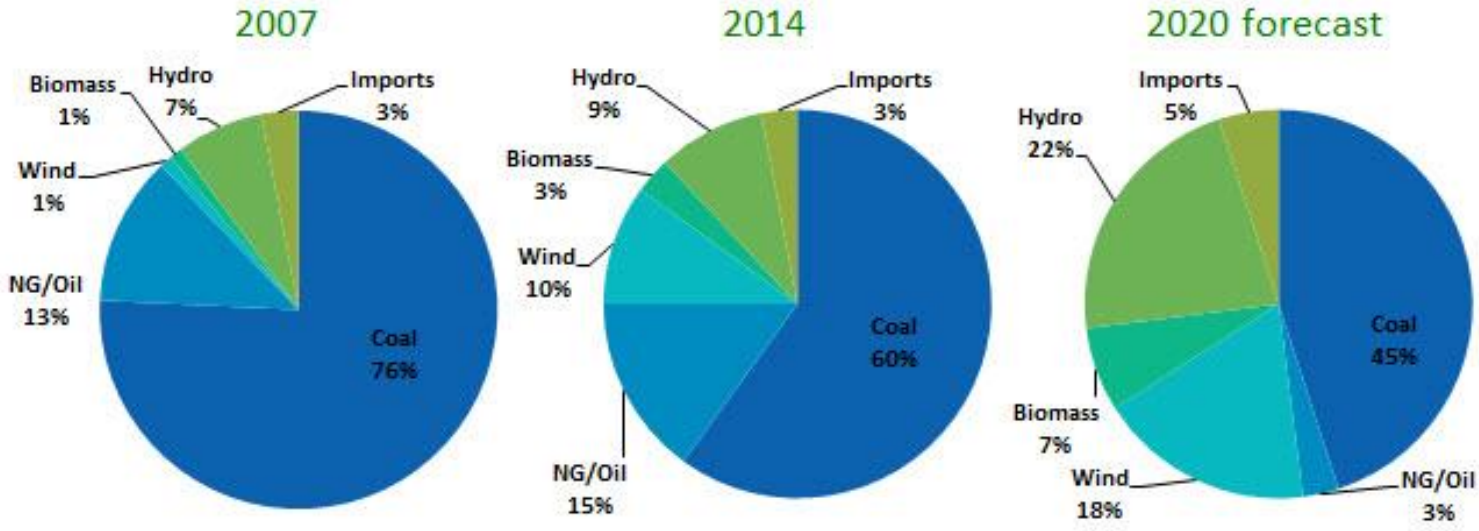
How we make electricity



Nova Scotia's Renewable Energy Transformation

- 25% Renewable Energy by 2015
- 40% Renewable Energy by 2020

- Peak demand: 2100 MW
- Low load: 625 MW
- Wind Generation: >600 MW



NSP Business Challenges

- Run Coal and Oil Generating Units in concert with Renewables to meet Daily Demand
- Use Technology to replace knowledge being lost due to company demographics
- Use Technology to reduce Operating costs involved in taking manual NDT readings from older non-instrumented assets
- Use Technology to enhance Predictive models that proactively alert SME of impending problems

Nova Scotia Power

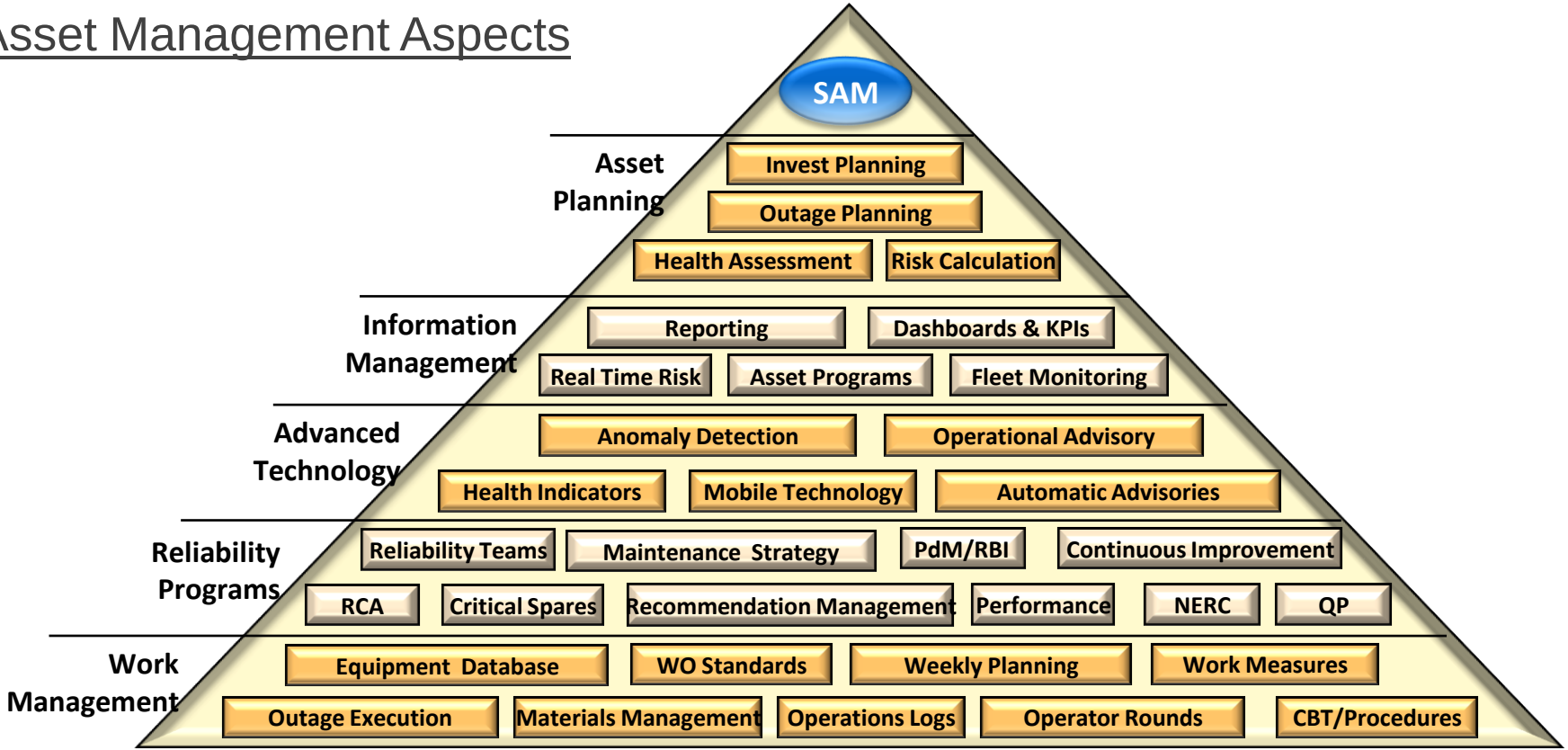
Nova Scotia Power, Inc. (NSPI), a privately owned, vertically integrated electric utility, provides electricity to 500,000 residential, commercial and industrial customers in Nova Scotia, Canada.

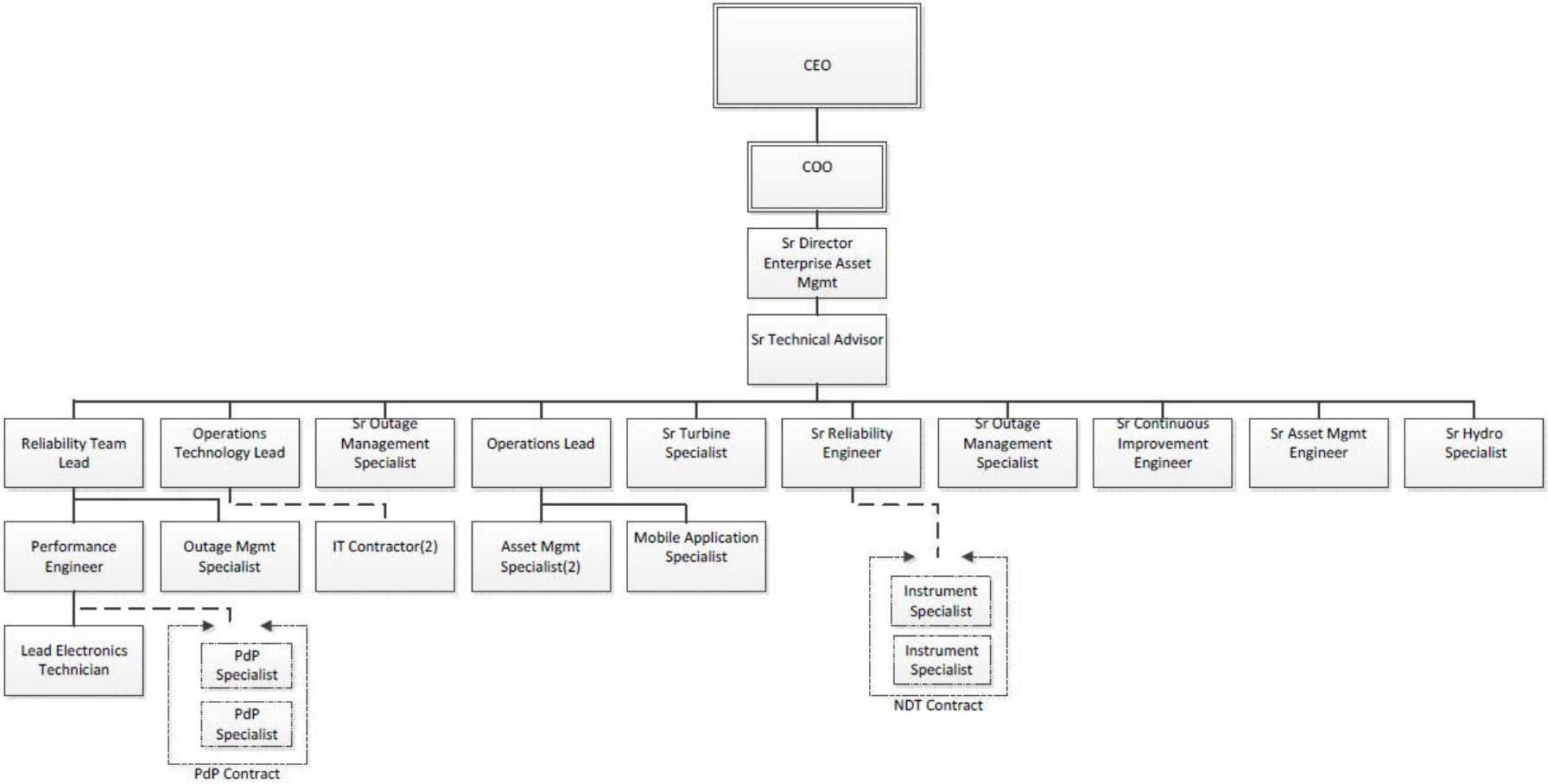
In 2011, NSPI beganthe design and deployment of its asset management program. An asset management office and a common work management system, complete with identical work management practices throughout the fleet, were established at that time.

Key program design features include:

- Incorporation of all operation activities;
- Fleet-wide standards, practices, programs and tools;
- Highly measured activities;
- Technology as an enabler.

Asset Management Aspects

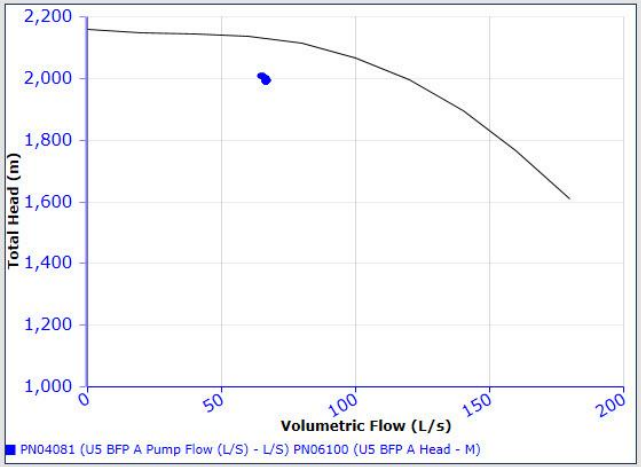




How NSP Uses PI

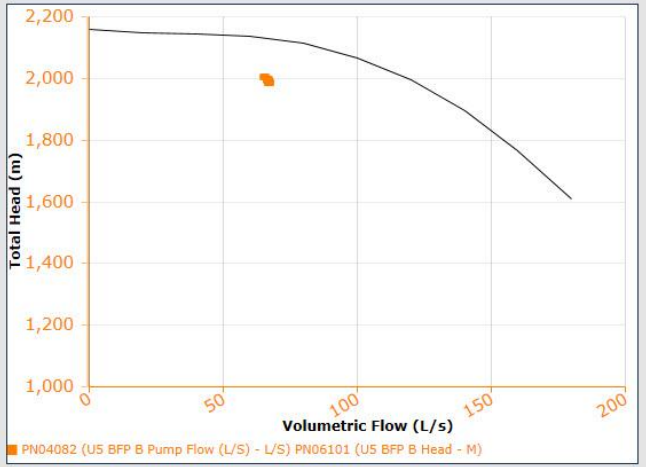
- Plant Overview ProcessBook displays
- Specialty Diagnostic Excel Sheets
- Lab Data Entry via Meridium Rounds
- All major asset classes have a Scientech model that uses DCS readings which are archived to PI tags

Boiler Feed Pumps A & B



Start Time:
03/22/2018 11:10:10

End Time:
03/22/2018 13:10:10



Boiler Feed Pump A		Value
In Service?		YES
Suction Pressure	kPag	471.7
Discharge Pressure	kPag	18719.5
Mass Flow	kg/s	62.9
Volumetric Flow	L/s	66.9
Recirculation Flow	kg/s	0.0R
Hydraulic Power	kW	787.8
Enthalpy Rise	kJ/kg	12.5
Balance Water Pressure	kPa	0.0

BFP A

Spray Flows		Value
Superheat	kg/s	5.028
Reheat	kg/s	0.257

Boiler Feed Pump B		Value
In Service?		YES
Suction Pressure	kPag	471.7
Discharge Pressure	kPag	18719.5
Mass Flow	kg/s	62.9
Volumetric Flow	L/s	66.9
Recirculation Flow	kg/s	0.0R
Hydraulic Power	kW	787.8
Enthalpy Rise	kJ/kg	12.5
Balance Water Pressure	kPa	0.0

BFP B

BFP A Performance		Actual	Expected	Δ
Head	m	1990.95	1881.72	109.23
Efficiency	%	26.27	74.86	81.27

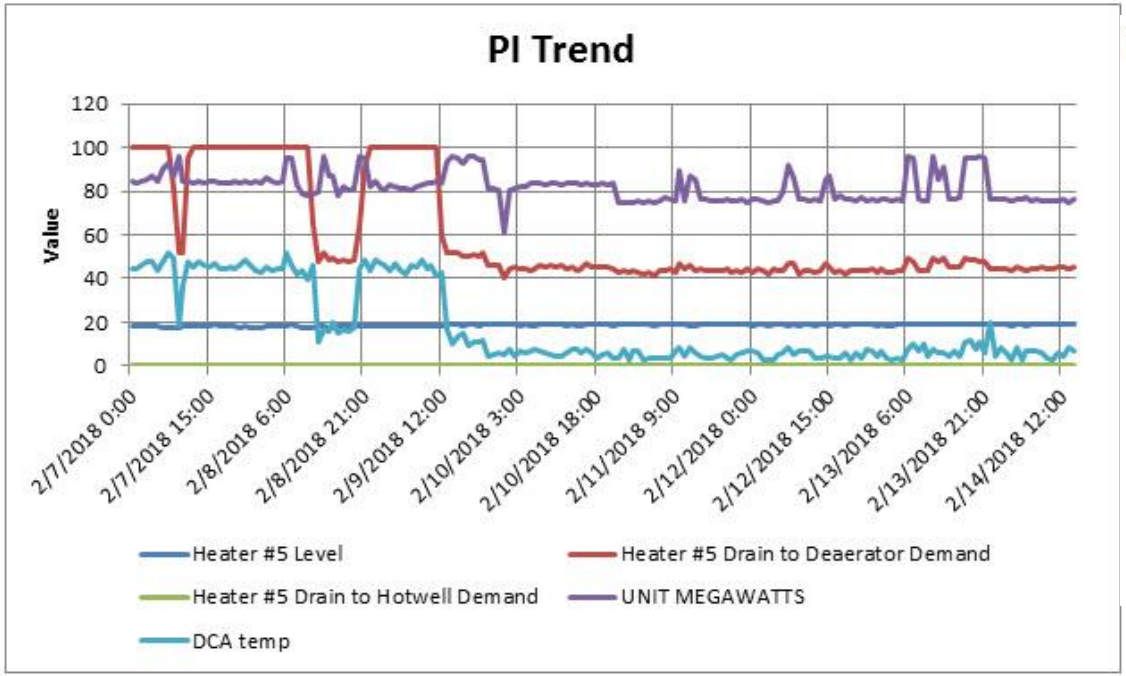
BFP B Performance		Actual	Expected	Δ
Head	m	1989.93	1881.72	108.21
Efficiency	%	26.26	74.86	81.27

The impact of having wireless thermocouples available:

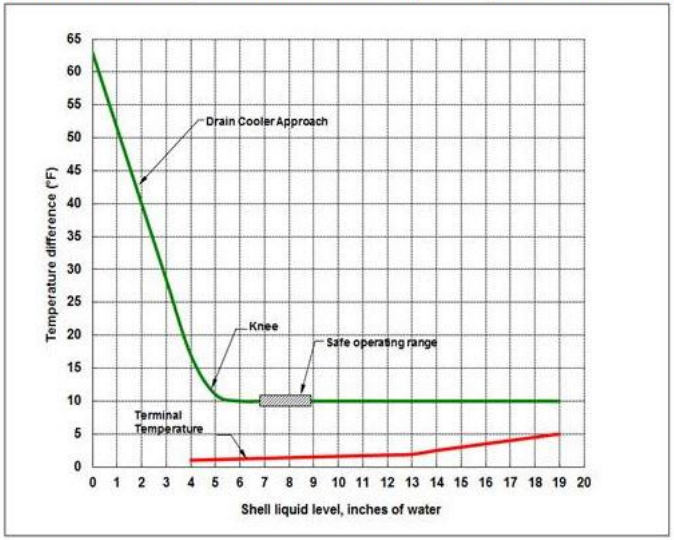
Installing thermocouples in the FW heater cascade drain lines enables performance assessment of the FW heater sub cooling zone. The difference between the cascade drain temperature and the FW heater inlet temperature is called the Drain Cooler Approach (DCA) temperature. When the DCA increases significantly, it is typically caused by level control problems resulting in low liquid level inside the heater. Operating with low liquid level increases steam erosion of heater tubes, control valves and downstream piping.

FW Heater Performance Summary									
FW Temps									
FW heater 7 out	deg F	---	---	---	---	463	---	---	---
FW heater 6 out	deg F	458	462	67	443	381	467	471	471
FW heater 6 in	deg F	399	398	78	383	328	408	392	414
FW heater 5 in	deg F	357	359	75	340	286	342	330	367
FW heater 4 in	deg F	315	319	73	299	250	273	274	320
FW heater 3 out	deg F	---	---	---	---	250	---	---	---
FW heater 2 out	deg F	238	230	73	230	208	205	65	234
FW heater 2 in	deg F	162	163	72	158	173	153	148	171
FW heater 1 in	deg F	97	104	65	94	81	97	89	88
FW Heater Temp Rise									
Temp rise - FW heater 7	deg F	---	---	---	---	82	---	---	---
Temp rise - FW heater 6	deg F	58	65	-12	60	53	59	79	56
Temp rise - FW heater 5	deg F	42	39	4	44	---	66	62	48
Temp rise - FW heater 4	deg F	42	40	2	41	37	69	57	47
Temp rise - FW heater 3	deg F	---	---	---	---	41	---	---	---
Temp rise - FW heater 2	deg F	76	67	1	72	35	53	-83	63
Temp rise - FW heater 1	deg F	65	60	8	64	93	56	59	83
FW Heater TTD									
TTD - FW heater 7	deg F	---	---	---	---	2	---	---	---
TTD - FW heater 6	deg F	5	7	176	5	1	6	2	7
TTD - FW heater 5	deg F	-5	0	124	-2	---	0	18	3
TTD - FW heater 4	deg F	-5	-4	134	-3	2	2	14	4
TTD - FW heater 3	deg F	---	---	---	---	62	---	---	---
TTD - FW heater 2	deg F	3	8	139	-3	4	5	151	9
TTD - FW heater 1	deg F	8	3	139	5	#VALUE!	2	-61	15
FW Heater DCA									
DCA - FW heater 7	deg F	---	---	---	---	12	---	---	---
DCA - FW heater 6	deg F	-1	-5	0	1	10	13	70	8
DCA - FW heater 5	deg F	2	-11	0	7	---	6	38	11
DCA - FW heater 4	deg F	5	-1	0	10	13	11	42	14
DCA - FW heater 3	deg F	---	---	---	---	13	---	---	---
DCA - FW heater 2	deg F	25	15	0	23	11	#VALUE!	16	18

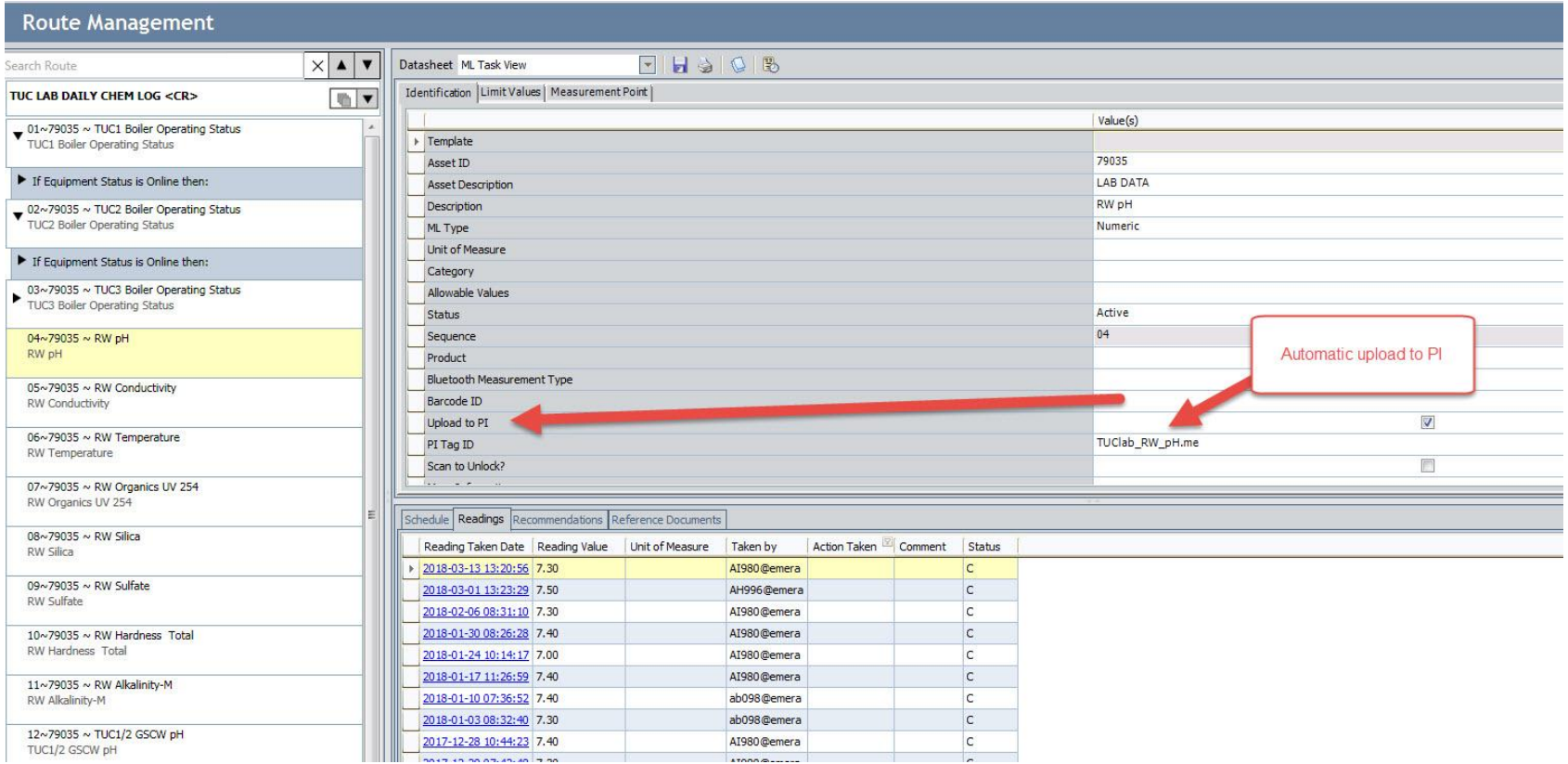
Here's a PI trend illustrating fluctuations in DCA and then improved level control.



This chart shows the impact of heater level on DCA (i.e. temperature difference on Y-axis).



PI Lab Data Entry via Meridium Interface



Excerpt from How to Extend the Life of a BFP

New Readings Available:

- Housing Temperature
- Ambient Temperature
- Housing Vibration

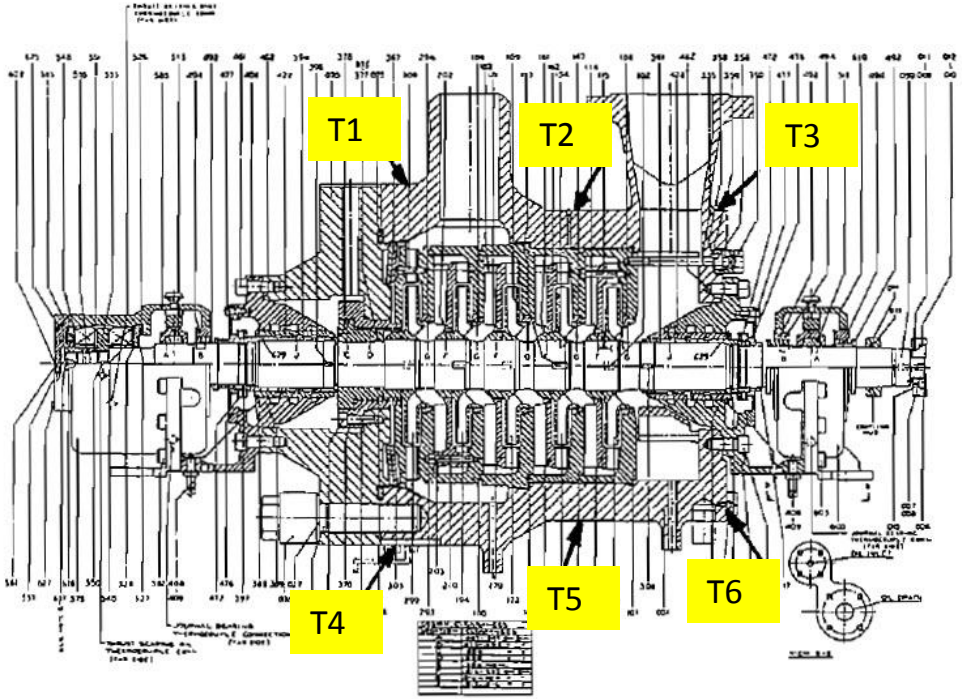


Figure 3. Cross Section View of a Boiler Feedpump (5BDXD520, Showing Six Locations: T1, T2, T3, T4, T5, T6 for Case Temperature Indicators for Determining a Warmed Pump).

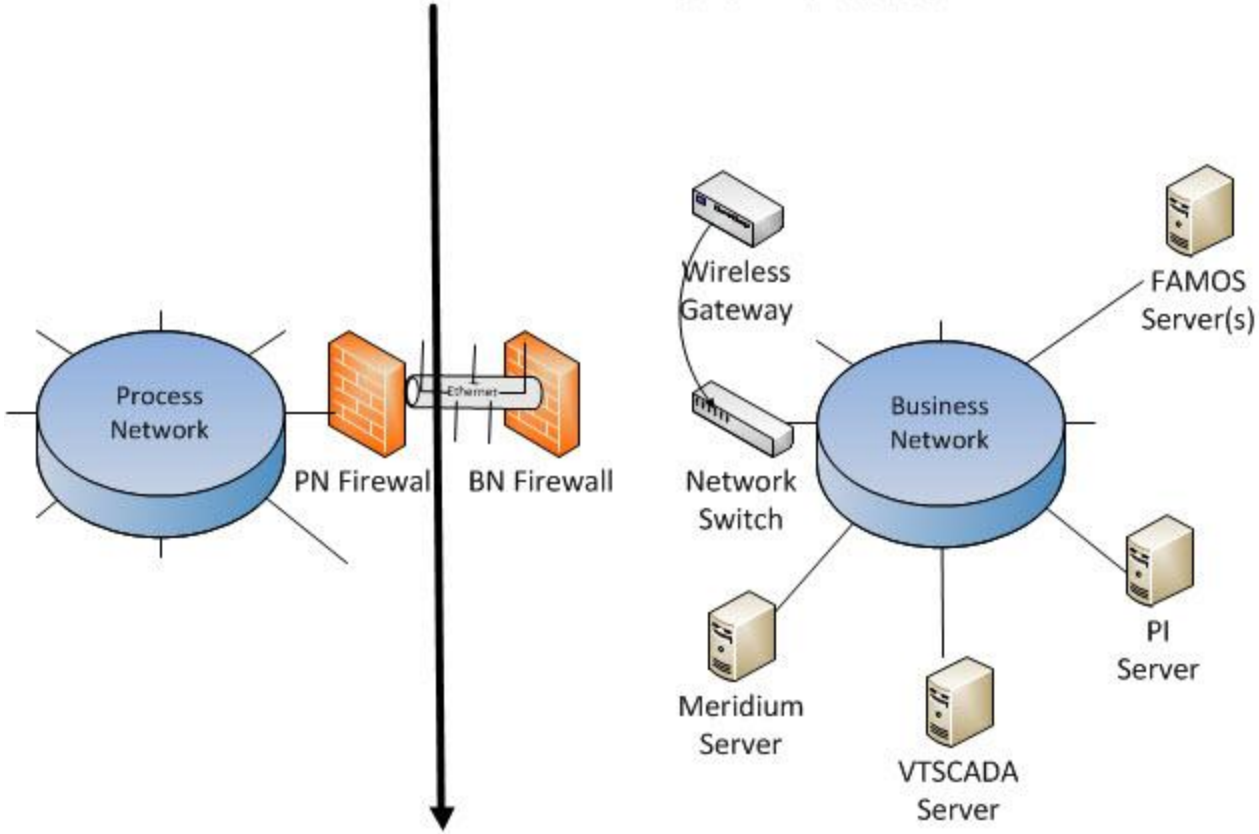
The Shopping List

Ambient Air Temperature
Housing Vibration and Temperature
Thermocouple(Liquid Temperature)
Valve Position
Motor Current (0-430 amps)
Pipe temperature (32-120 F)

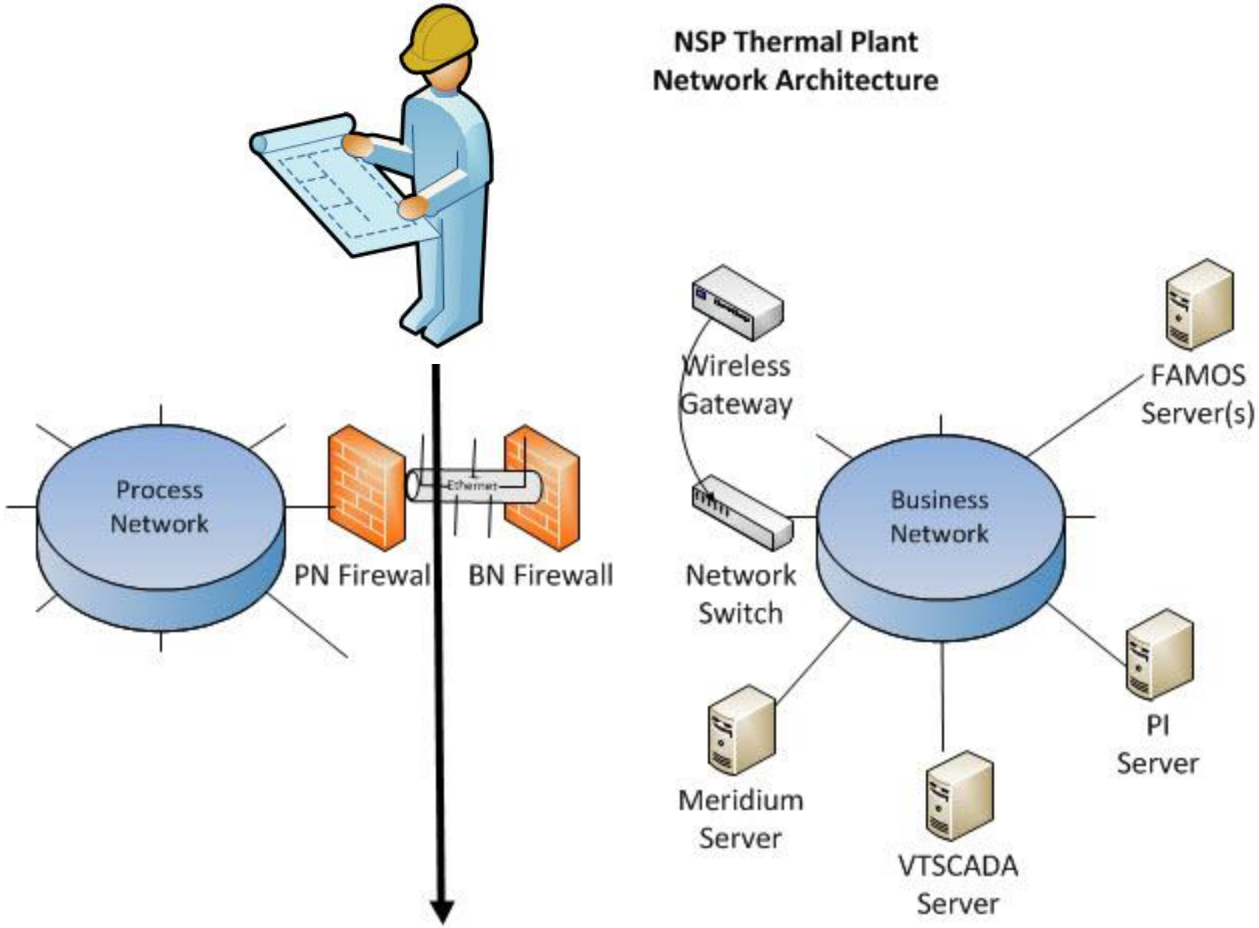
The Vendors

Aspentech	www.aspentech.com
Banner Engineering	www.bannerengineering.com
Emerson	www.emerson.com
Fossil Power	www.fossil.ca

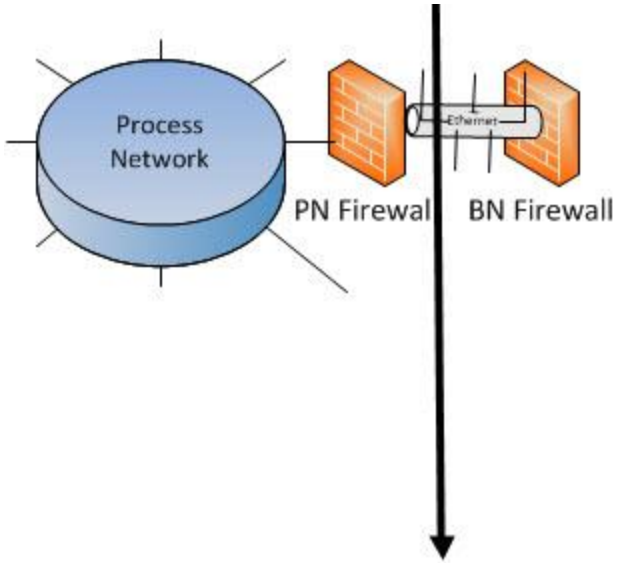
NSP Thermal Plant Network Architecture

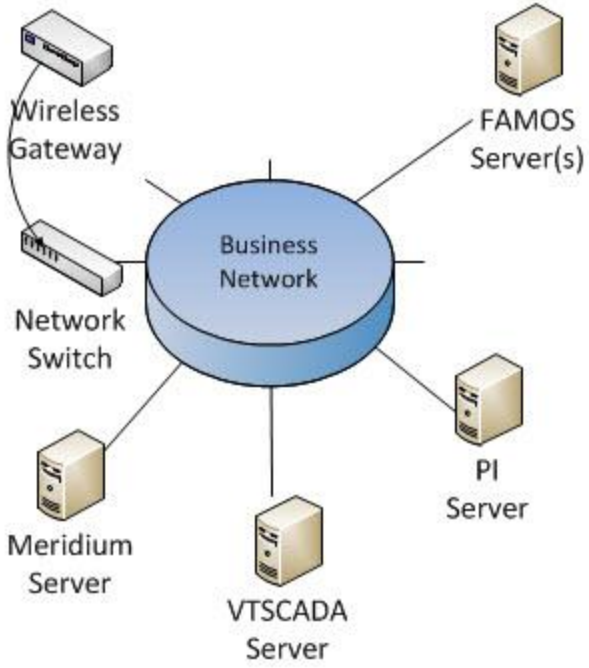


NSP Thermal Plant Network Architecture

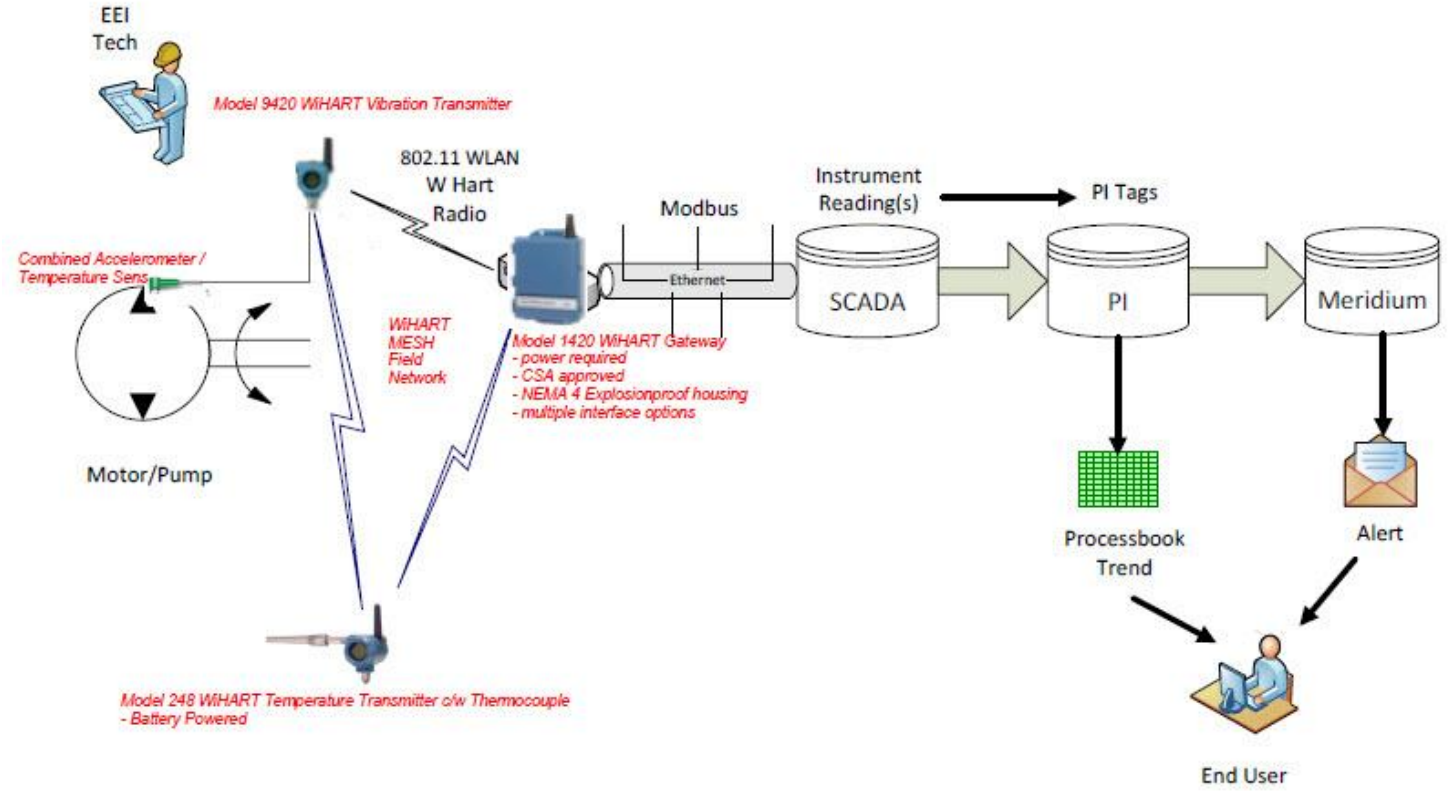


NSP Thermal Plant Network Architecture

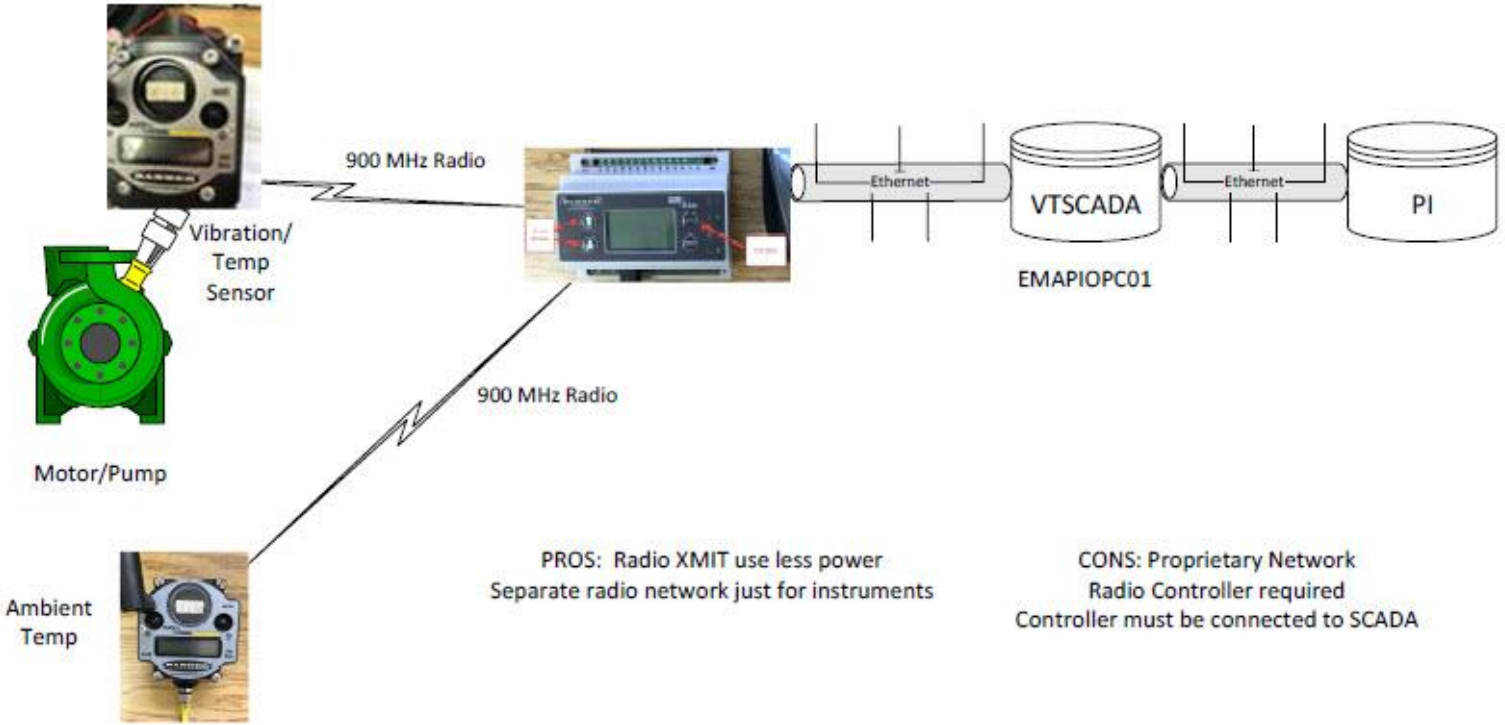




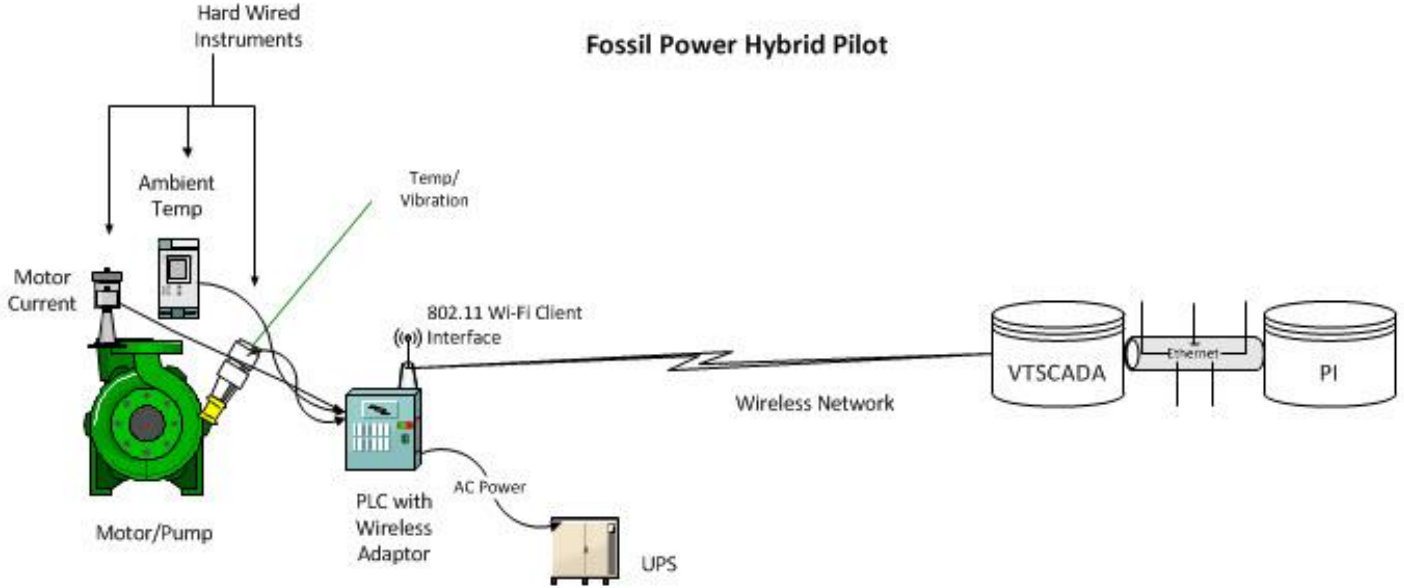
Classic Emerson Wireless Hart



Banner 900 MHz Radio Network



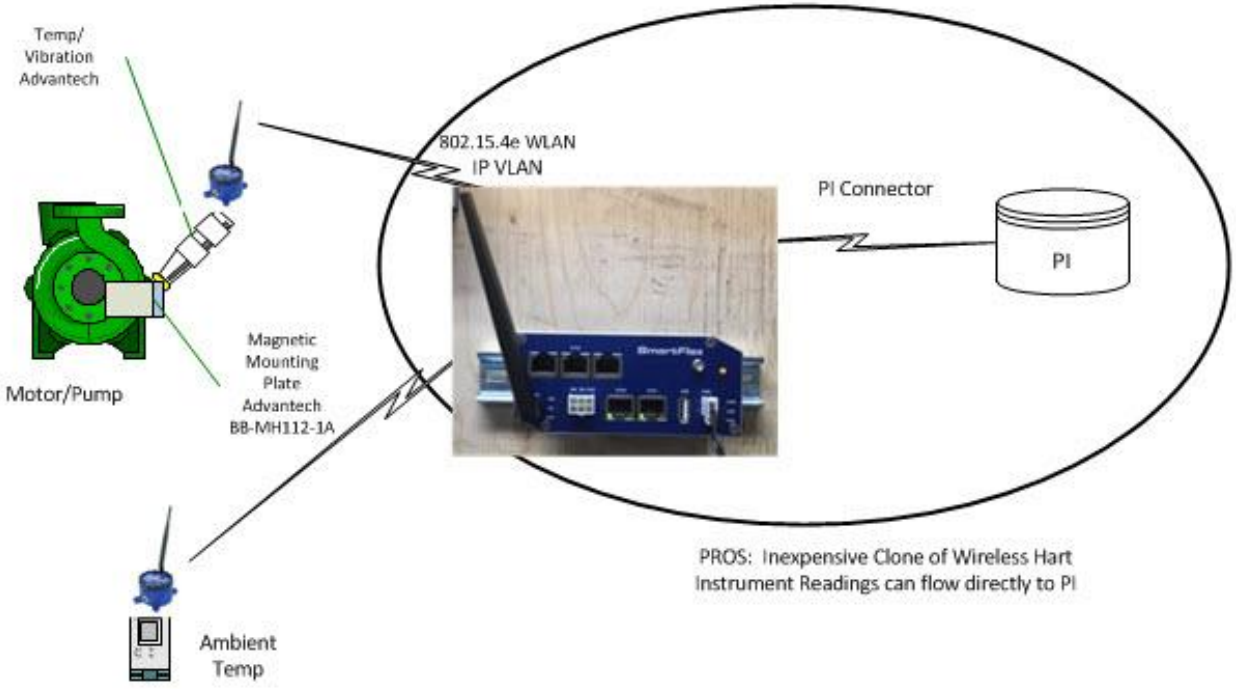
Fossil Hybrid System



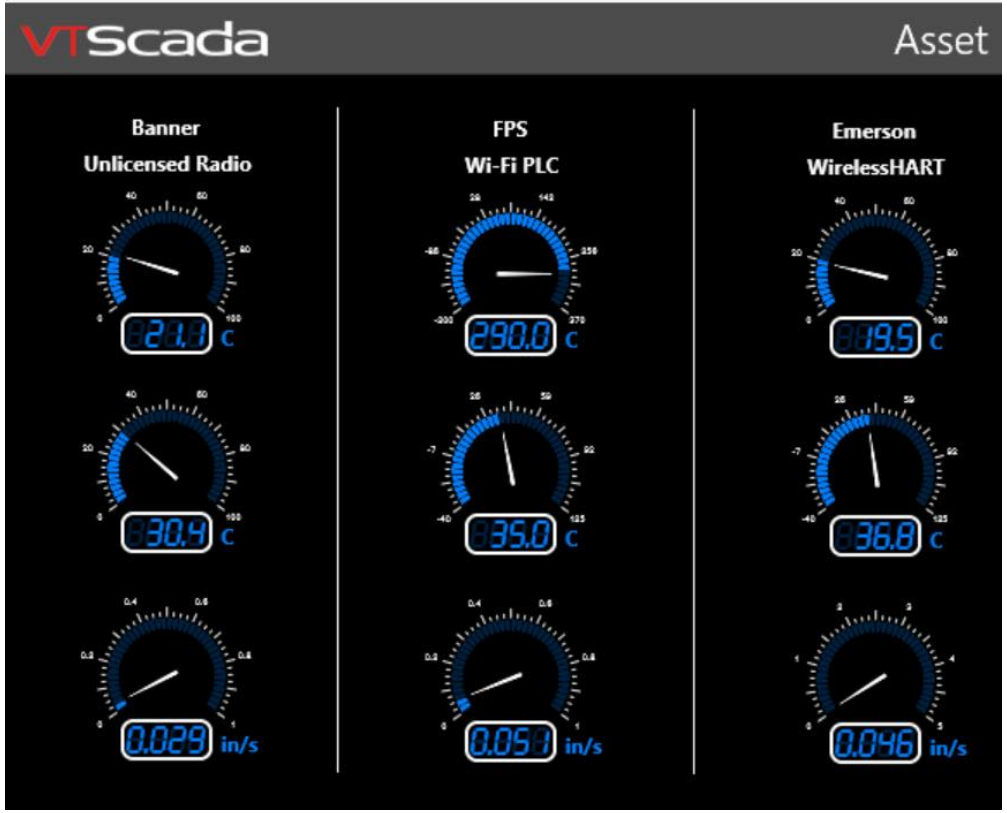
PROS: Multiple commodity instruments on single PLC

CONS: Needs AC Power

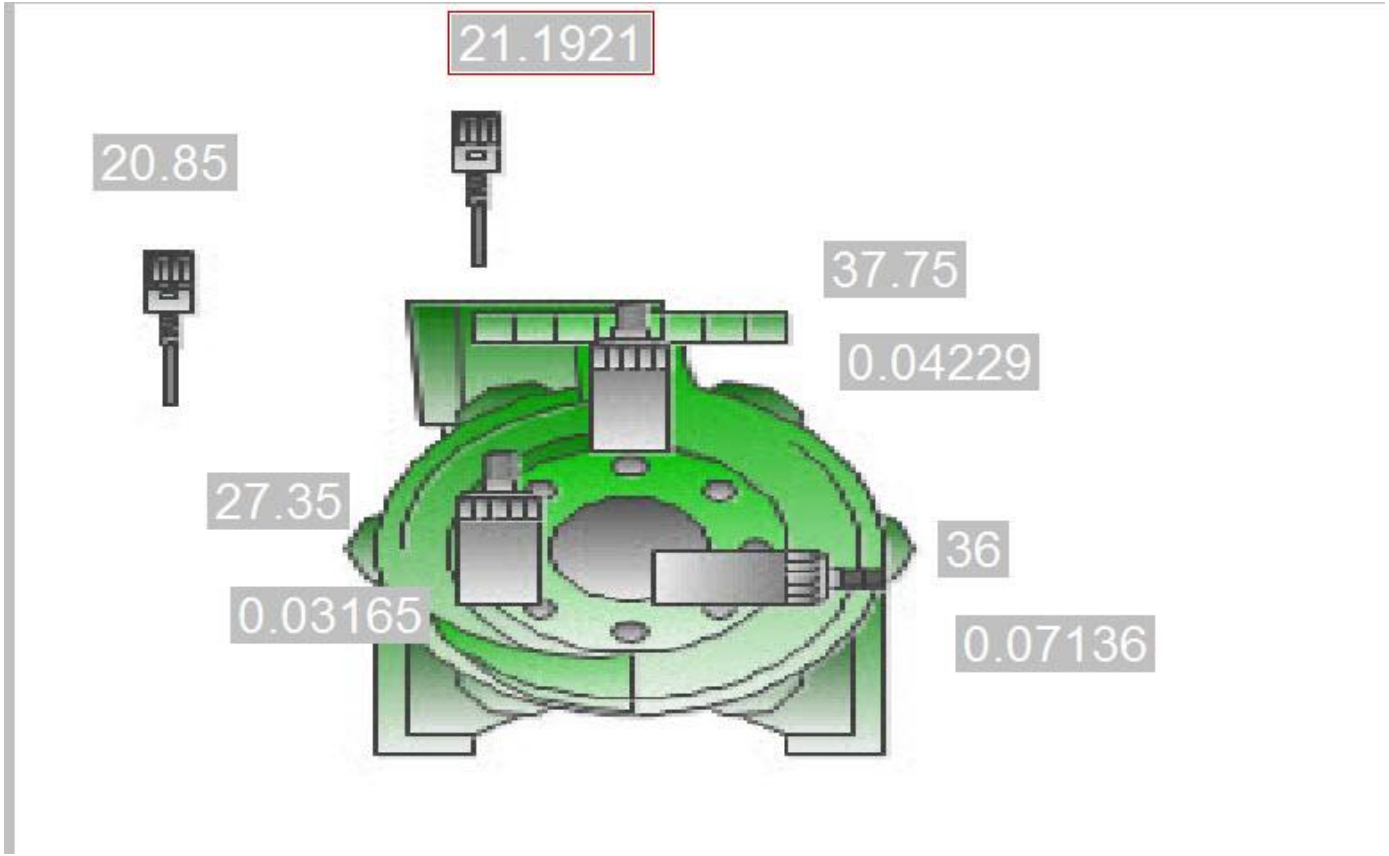
Aspentech Wireless Pilot



VTSCADA Display



ProcessBook Display



Assessment Criteria

Characteristic
Cost Effective(off the shelf)
Available in 4-6 weeks from vendor
First Order arrived on time and in right place
Sensor can use existing business wireless(Hybrid)
Sensor requires wireless transmitter(XMIT)
Sensor Easily wired to wireless XMIT
Wireless XMIT Requires Wireless Gateway
Sensors are scalable for large quantities
VLAN required Gateway to SCADA server
Wireless XMIT supports multiple sensors
Sensor Requires AC power
Sensor Requires battery
Battery easily connected to Sensor
Battery life monitor available online
Battery lasts multiple months
CSA or equivalent electrical std for safety
Power supply reliable for plant conditions
Equipment proprietary or can be managed by NSPI
Sensor easy to connect to equipment
Reading easily parsed at PI or SCADA server
Customer Service

The Results

One system does not fit all(distance, penetration, instruments)
All systems were reasonably easy to install
All Systems had good technical support
Battery life(where required) and default reading setup was easy
Unless you use Aspentech a VTSCADA expert is required
Engineers involved liked VTSCADA capability

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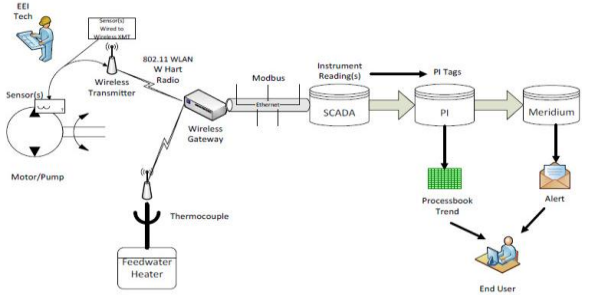
Nova Scotia POWER
An Emera Company

Customers count on us for energy to power every moment of every day, and for solutions to power a sustainable tomorrow.



CHALLENGE

Retrofit old (+25 yr) assets with realtime instrumentation in a cost effective manner

- Lack of hard wired connections to DCS systems
- Spotty availability of AC Power

SOLUTION

A menu of wireless and wired solutions designed for the structural case

- PI Tags to record the base instrument readings
- Reading values to replace expensive manual collection
- Readings to augment equipment models

RESULTS

Proof of concept for 4 vendor solutions and a template for fleet wide adoption.

- How hard were they to implement?
- How much labor is involved in keeping them online

Retrofitting Aging Plants with Wireless Instruments at Nova Scotia Power

- **Mike Greene**
- Mike.Greene@nspower.ca
- Operational Technology Leader
- Nova Scotia Power

Questions

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

State your **name & company**

Please remember to…

Complete the Online Survey for this session

Merci

谢谢

Danke

Спасибо

Gracias

Thank You

감사합니다

ありがとう

Grazie

Obrigado

Optional: Click to add a takeaway you wish the audience to leave with.