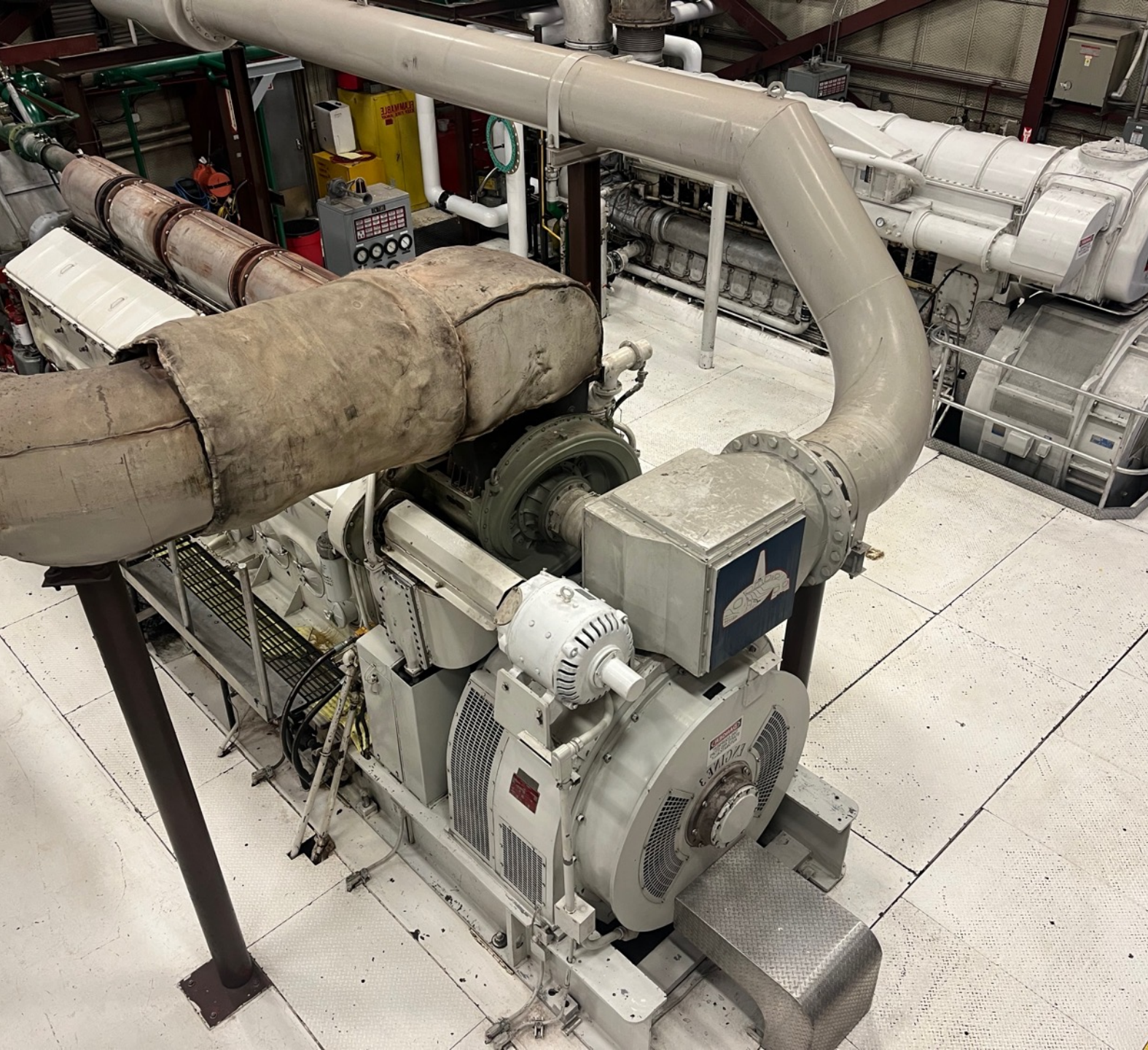




CORDOVA
ELECTRIC CO-OP
DIESEL
MODERNIZATION

RUSSELL GOSS CEC



GENERATION PLANT PERSPECTIVE



Controls



CAT upgrades



Fuel efficiencies

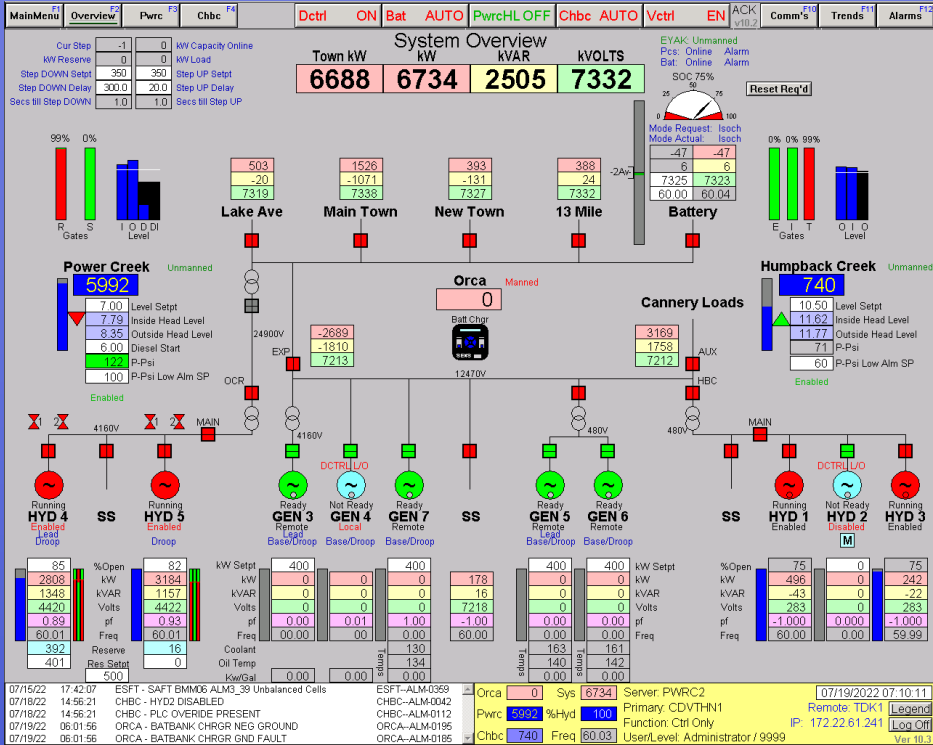


Heat Recovery



Load Sharing

CONTROLS/AUTOMATION



Obsolete switchgear replacement



Time Error Correction



Fairbanks Morse – Add sensors, upgrade relays, Automation



Improved Voltage/VAR Controls



Load Sharing – Demand control system, BESS ISOC operations (future)

GEN CONTROL

- Cats 5&6 are now on our gen control program which allows fine tuning of alarms, stops, and shutdowns.

GEN5
GEN6
GEN7

Generator #5 Detail

Miscellaneous

Health Counter (Clock Seconds)	7
Global Switch Debounce Delay	2.0
Breaker Fail To Sync Delay	120.0
Maint Interval Hrs	0
Voltage Step Pulse Width	0.2
Readable Cyl Temp Range	10 -1200
Baseload kW Setpt Range	400 -1000
Baseload kW Step Size	50

Control

Off Lcl/Run
BD Rem

 Control Switch

Lcl Rem

 Switchgear

Auto Sync Enabled
Rated Speed Request Off

Unit Status Ready

Alarms

Crank Configuration

Flywheel # Teeth	183
Prelube Secs	120.0
Prelube Remain	120.0 ✔
Crank Cutoff RPM	10
Crank Time in Secs	10.0
Secs Between Cranks	10.0
Max Crank Attempts	1
Actual Crank Attempts	0
Oil Warmup Temp	60
Max Warmup Secs	60.0
Warmup Remain	60.0
Rated Cooldown Secs	300.0
Rated Cooldown Remain	0.0
Idle Cooldown Secs	200.0
Idle Cooldown Remain	0.0
Postlube Secs	0.0 ✔
Postlube Remain	0.0

Daytank Control

Pump Overrun Delay	960.0
Pump Stop Level	80
Pump Start Level	70
Fuel Cooler Fan	

Fuel ✔ 80 %Full

Coolant flow switch statistics

Max Time to Enable	0.0
Max Overtime After Enabled	0.0

Alarm Configuration

	In/L	Out/R	Mask	Lo S/D	Lo Stp	Lo Alm	Hi Alm	Hi Stp	Hi S/D
Generator RPM		0					1320	0	1360
Air Filter Diff In/H2O	0	0					0	0	0
Crankcase Psi		0.13					2.00	0.00	0.00
Coolant Temp	162	161	30.0	0	0	0	207	215	225
Fuel Filter Diff Psi		0					40	0	0
% Fuel Daytank Level		80		0	0	65	85	0	0
Fuel Psi		0	60.0	0	0	20	95	0	0
Oil Filter Diff Psi		0					20	0	0
Idle Oil Psi		0	15.0	12	0	15			
Rated Oil Psi		0	120.0	25	0	30	0	0	0
Oil Temp	139	0		0	0	80	235	0	0
After Turbo Air Temp		151					210	0	0
Rear Bearing Temp		0					130	0	0
Hottest Stator Temp		102					172	0	0
Coollest Cyl Temp	16	159		0	0	250			
Hottest Cyl Temp	4	167					1050	0	0
Cyl Temp Diff Temp		8	120.0				150	0	0

Generator Data

kW	Amps	Volts	kVAR	Pf	Freq
400					
0	0	0	0	0.000	0.00

Show All
Hide Unused

Ver 10.0-7

DEMAND CONTROL

Generation Requirements

Demand Control Looks at the generation needed and sizes available to select the correct generator to run.

Demand Control Config

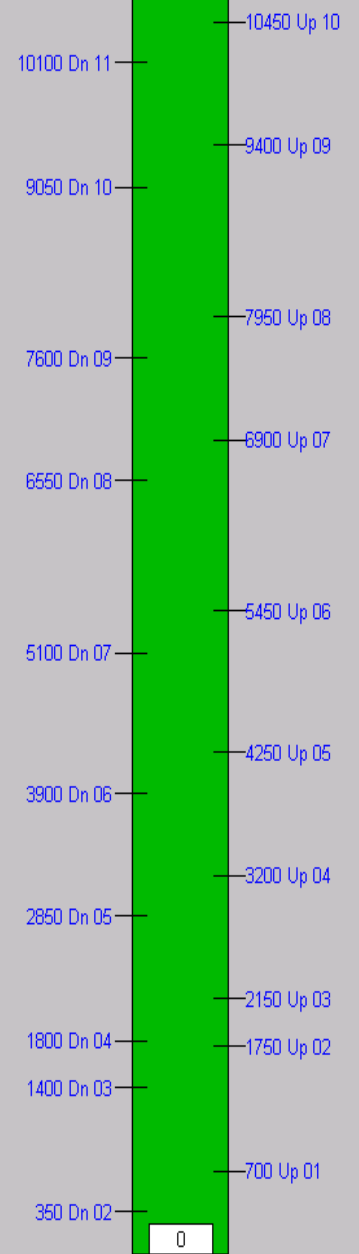
Enabled

Cur Step	-1	Req	○ ○ ○ ○ ○
KW Capacity Online	0	Avail	● ● ● ● ●
KW Load	0	Not Rmt	○ ○ ○ ○ ○
KW Reserve	0	Lockout	○ ○ ○ ○ ○

Step DOWN Res Setpt	350	Step UP Res Setpt	350
Step DOWN Delay	300.0	Step UP Delay	20.0
Seconds till Step DOWN	1.0	Seconds till Step UP	1.0

Step #	Qty 01	Qty 02	Qty 03	Qty 04	Qty 05	Qty 06	Qty 07	Qty 08	Qty 09	Qty 10
20	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
10	2	2	1	0	0	0	0	0	0	0
9	1	2	1	0	0	0	0	0	0	0
8	2	1	1	0	0	0	0	0	0	0
7	1	1	1	0	0	0	0	0	0	0
6	2	0	1	0	0	0	0	0	0	0
5	2	1	0	0	0	0	0	0	0	0
4	1	1	0	0	0	0	0	0	0	0
3	0	1	0	0	0	0	0	0	0	0
2	2	0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0

Unit Size	01	02	03	04	05	06	07	08	09	10
Unit Rating	1050	2500	3700	0	0	0	0	0	0	0
Qty of Size	2	2	1	0	0	0	0	0	0	0
Lead of Size	1	1	1	0	0	0	0	0	0	0

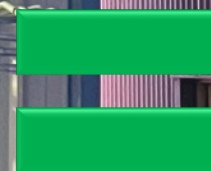


CAT UPGRADES

Heat
Recovery



Demand
Control



Fuel
Efficiency



HEAT RECOVERY

- ✓ Installation of heat exchangers to recover heat prior to radiator, and inject into the upgraded heat loop to preheat remaining diesel generation units and heat the building
- ✓ Utilize excess heat once engine pre heat and building heat is satisfied in our new snow melt systems reducing manpower and parasitic load
- ✓ Reduction in oil fired boiler use for a substantial annual fuel savings

COOLING SYSTEMS

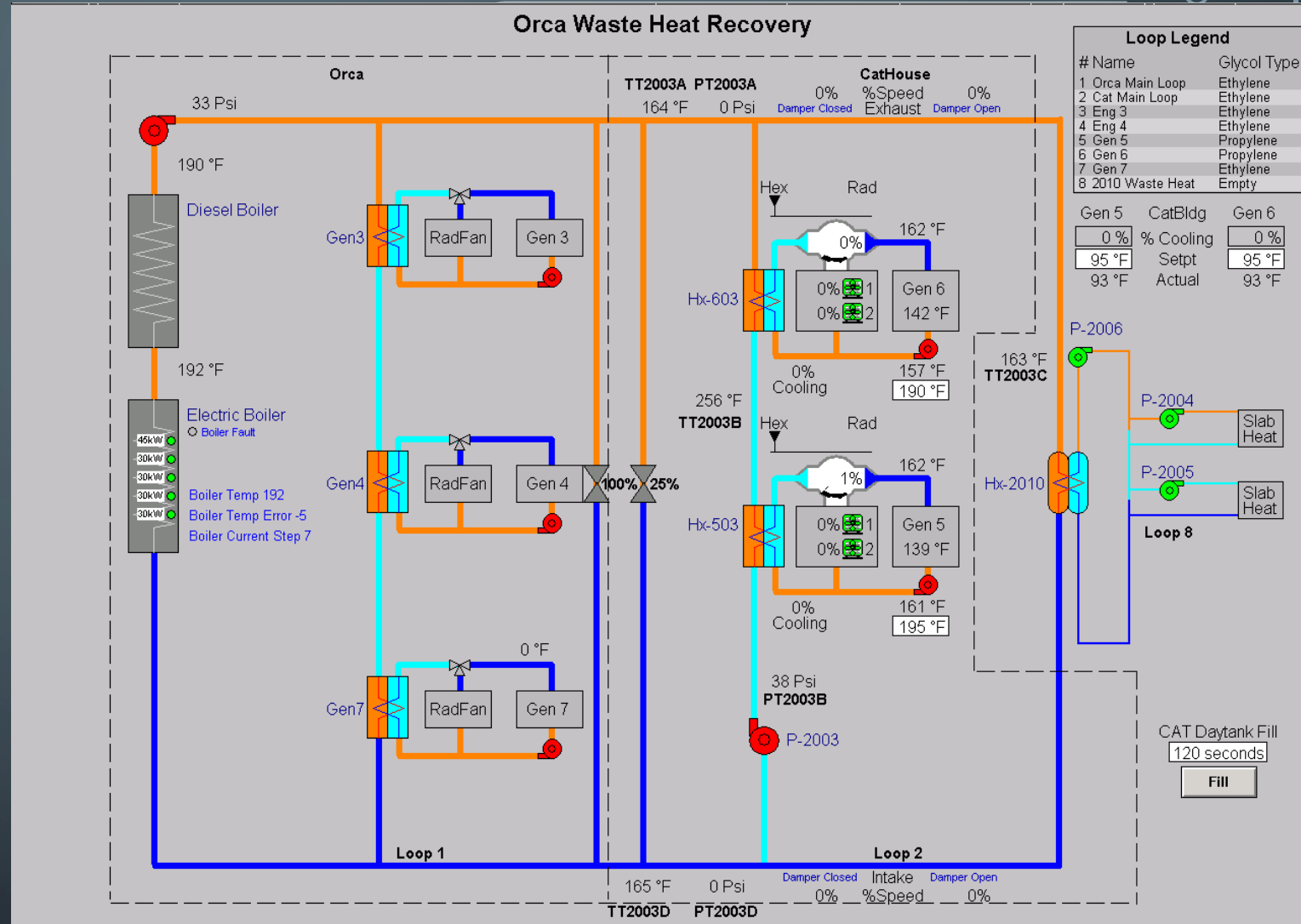
- ✓ Repair and service existing cooling systems to relieve clogged arteries and promote more efficient heat transfer
- ✓ Inlet and exhaust air optimization through building controls to conserve heat and promote precise running conditions
- ✓ Installation of additional sensors to monitor heat cycles and maintain optimum pre-heat conditions for back up generation units

FUTURE UPGRADES

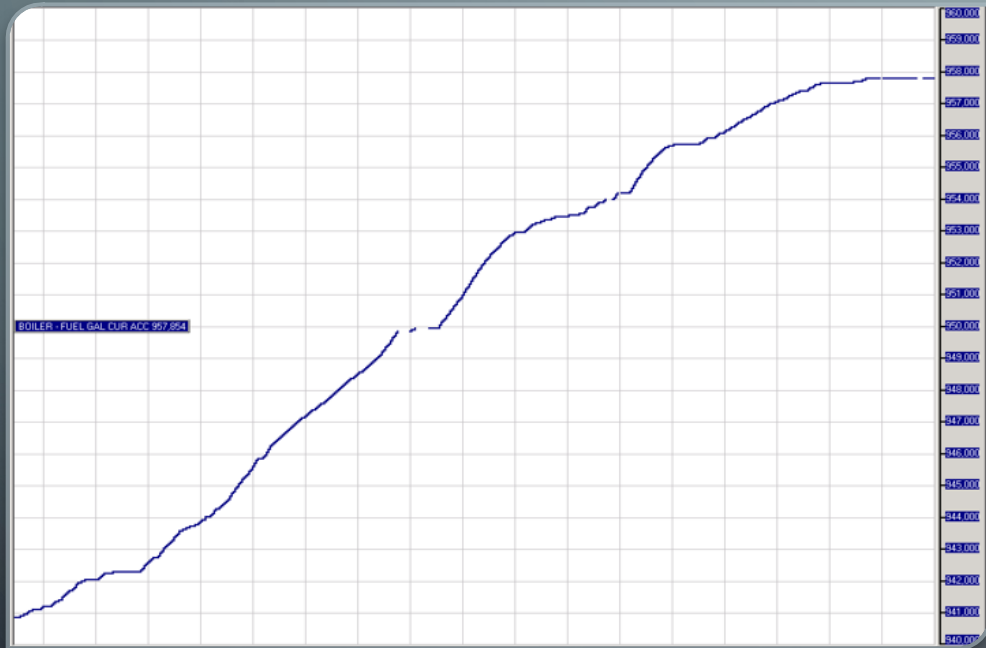
- ✓ Electronic fuel injection
- ✓ Heat recovery expansion to provide heat to other buildings
- ✓ Expand bulk fuel storage
- ✓ Evaluation of fuel coolers gains. (if there are any noticeable gains after being in service for a year)

BUILDING HEAT LOOP

- ✓ Current configuration allows for the Generator 5 and 6 to preheat engines 3,4,7 as well as supply heat to the Orca building
- ✓ When engines 5, and 6 are off and there is excess hydro power available we can supply preheat and building heat with the electric boiler
- ✓ When the electric boiler is unavailable then we can provide pre-heat and building heat with the diesel boiler. Current outlook is that the diesel boiler will not be required to be in service.



BOILER FUEL SAVINGS



- Diesel fired boiler use has been drastically reduced and has resulted in substantial fuel savings. Current estimates are a savings of ~8000 Gallons per year. This is very exciting to us for the savings that we can pass along to our members. It also reduces the amount of emissions that we are responsible for. Picture at left is the fuel accumulator over the past 2 years.