SEAPA Board of Director's Meeting
Director of Special Projects Report
Petersburg, Alaska
September 14, 2015

Photo Taken May 2015

Load Forecasting Effort

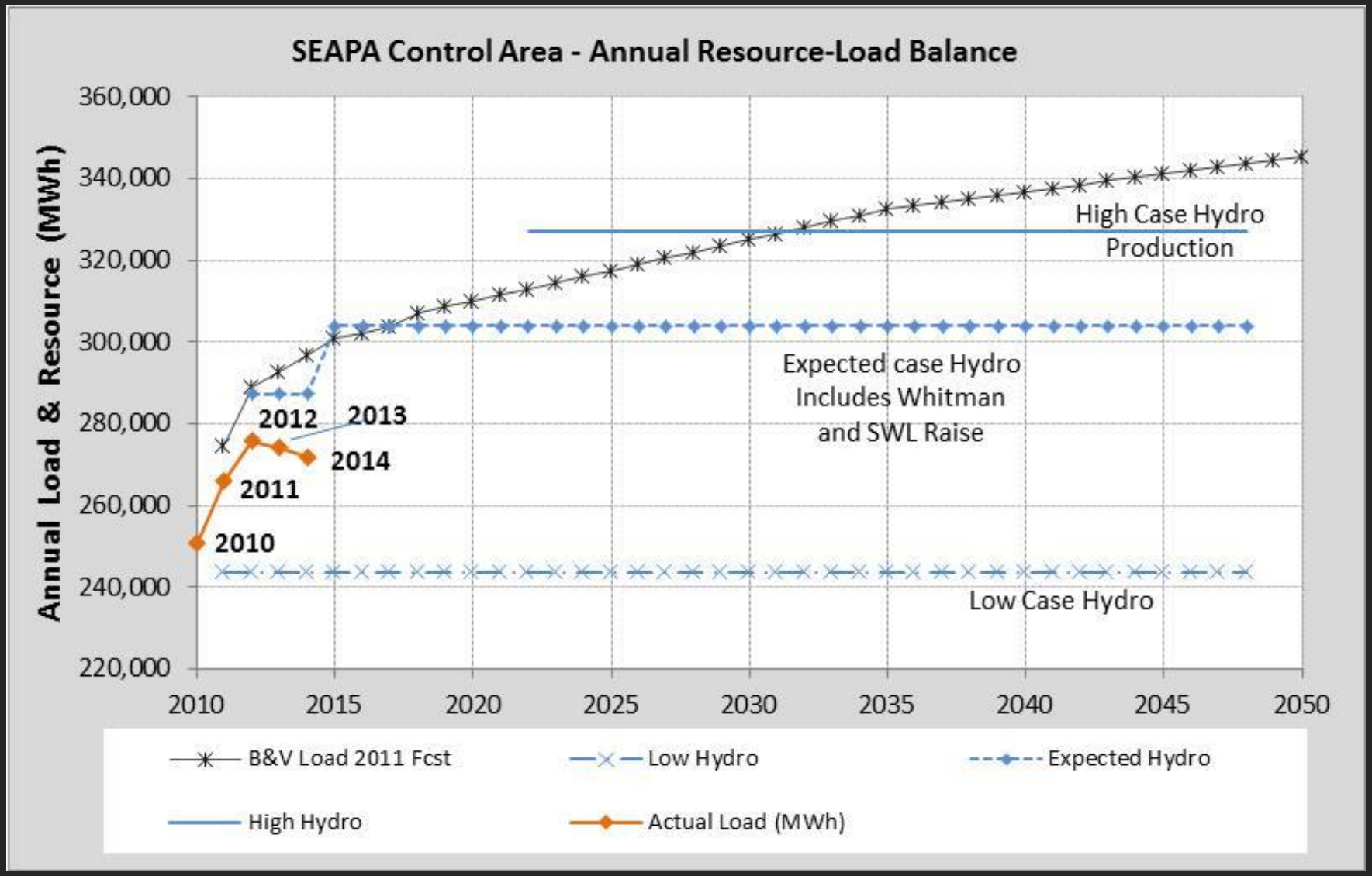
Integral part of long term planning
How much energy do you need in the next 5 years, 10, 20 years? How much power do you need in the next 5 years, 10, 20 years?-

It's a process, not a number

We need to have intelligent quantitative processes in play so we can tell outside entities including policy and political stakeholders that we have a plan…

no load forecast, no plan

Load Forecasting Effort



Load Forecasting Effort- data Request

1. Monthly kWh energy sales, number of customers and revenues by customer class for each calendar year, 2012 through 2014, and the first four months of 2015.

2. Monthly peak demand for KPU for each calendar year, 2012 through 2014, and the first four months of 2015.

3. Monthly energy generation and energy purchases for each calendar year, 2012 through 2014, and the first four months of 2015.

4. Monthly energy sales and demand for each of KPU's largest 25 customers for each of the past three years, 2012 through 2014.

5. If available, total system daily energy load (KWh) and peak demand for 2014.

6. If available, total system hourly loads (KWh) for 2014.

Load forecasting Effort

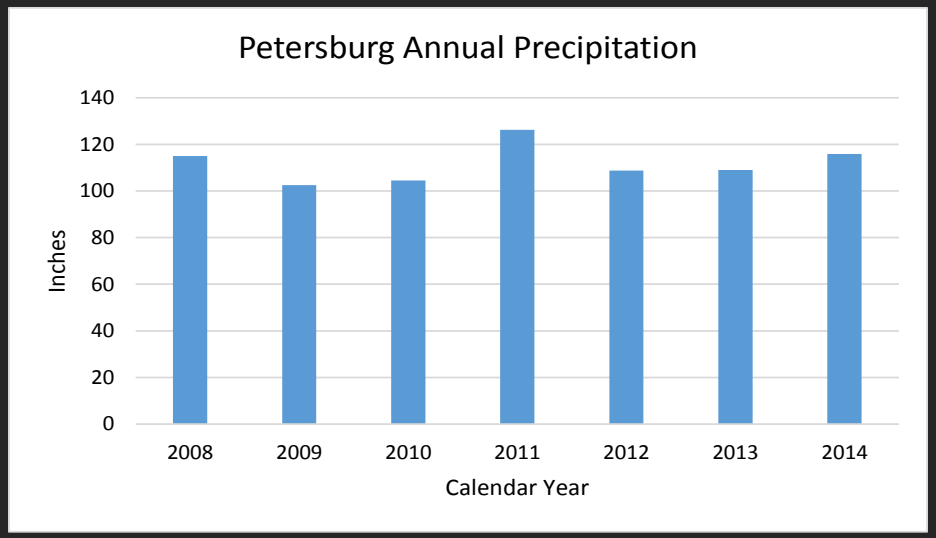
3 Examples of how a load forecast feeds the SEAPA planning process:

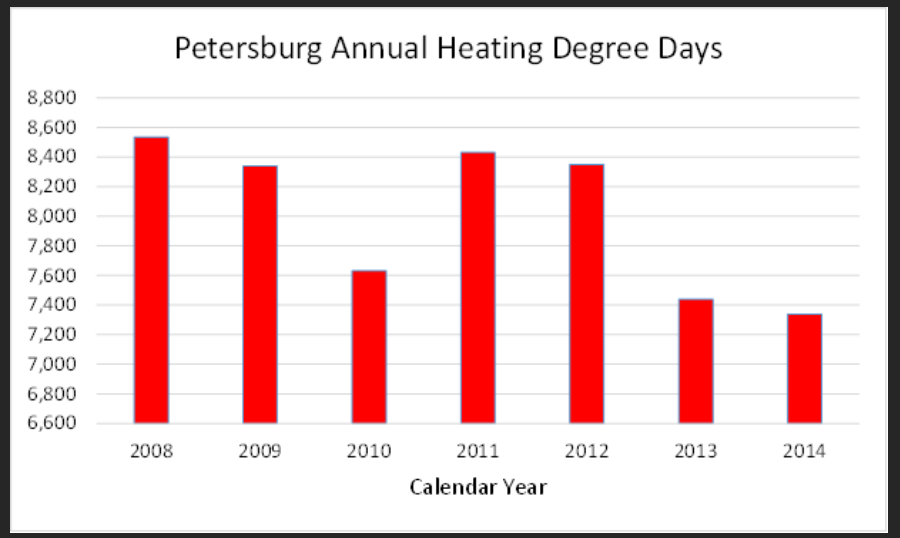
1. SEAPA's weekly schedule call-Power
2. Water management projections-Energy & Power
3. SEAPA Revenue Forecast-Energy

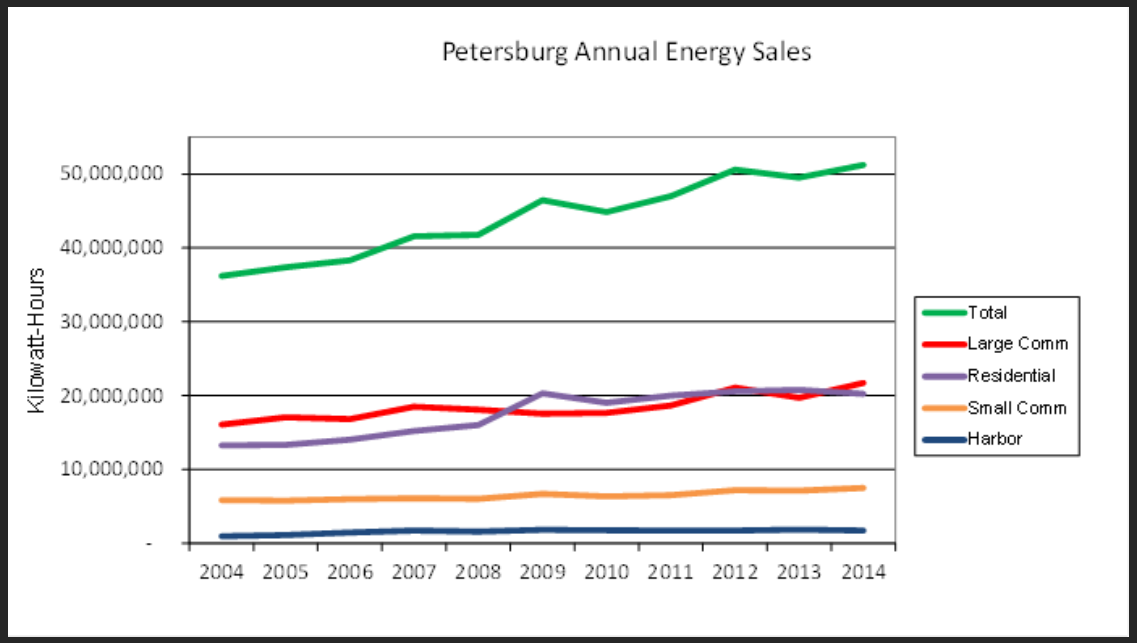
Energy (kWh) Monthly kW-hr

Load (monthly total kWh)	
- Municipal Hydro	
- SEAPA Hydro	
Balance	Neg Balance => Diesel Generation
	Pos Balance => Spill at Hydro

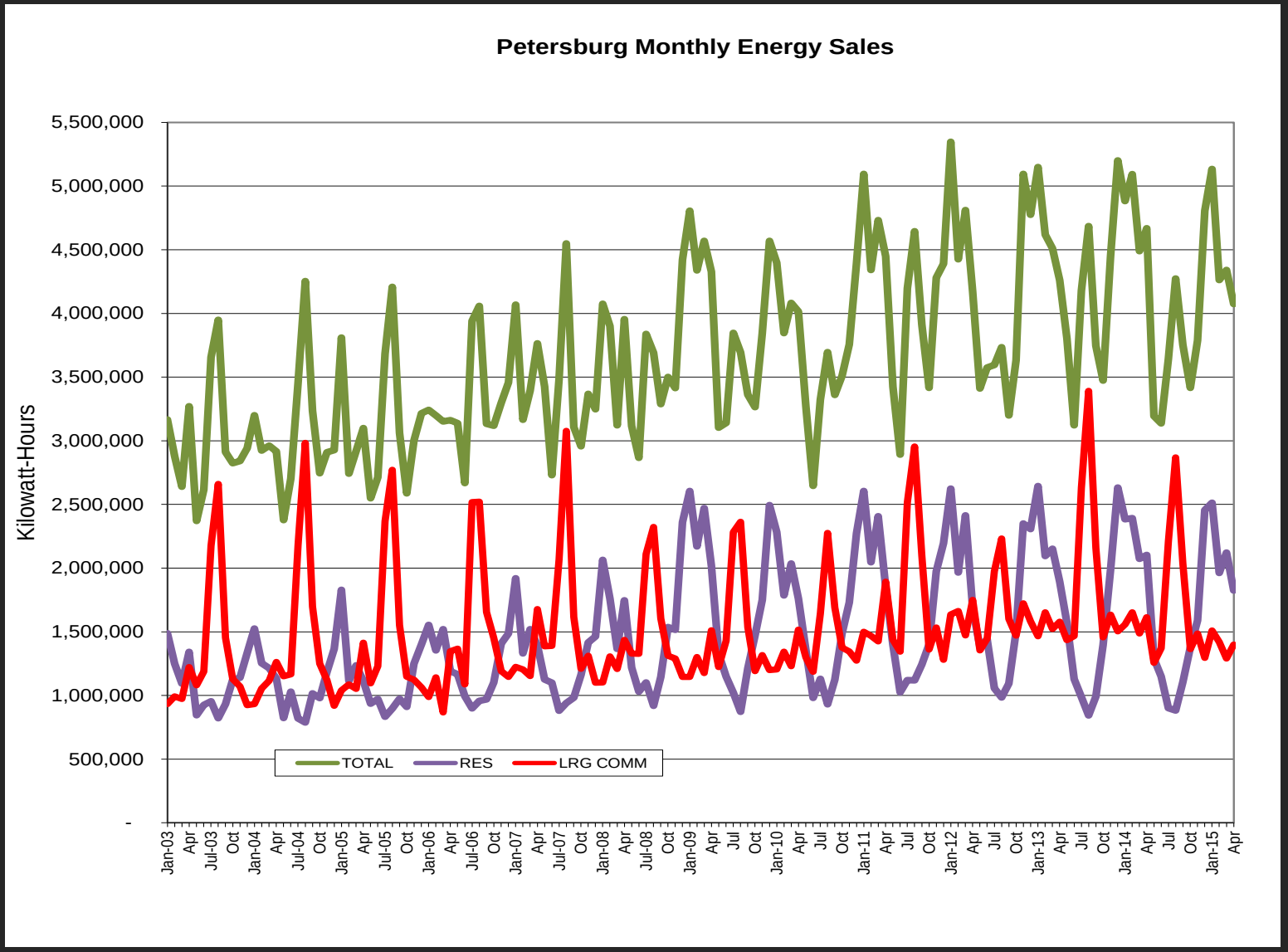
Load Forecasting Effort- Petersburg



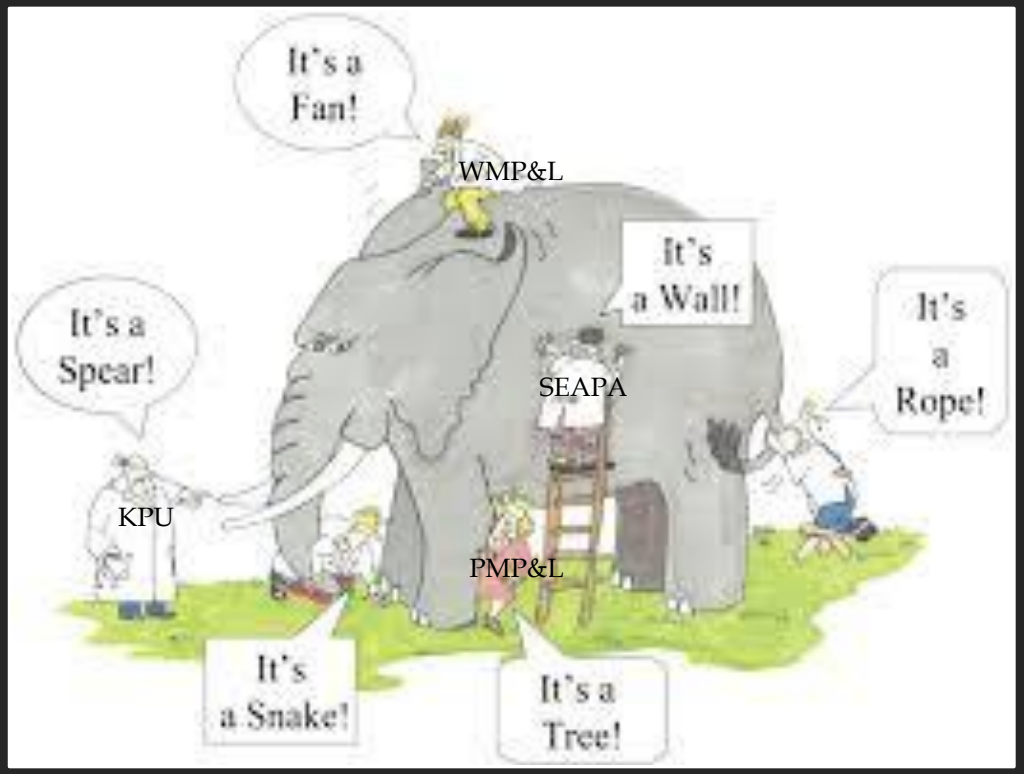




Load Forecasting-Petersburg

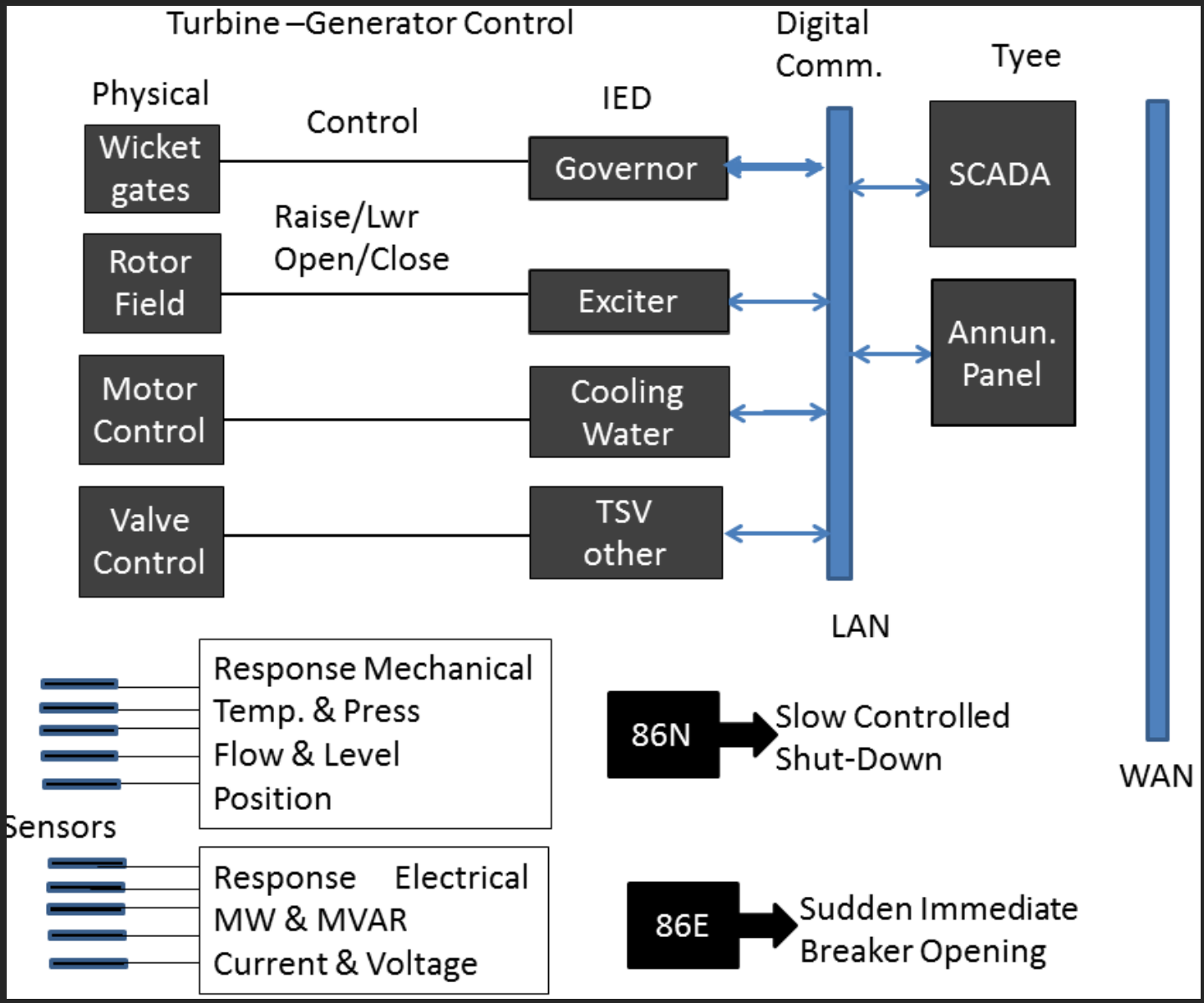


Load Forecasting Effort- we need better glasses

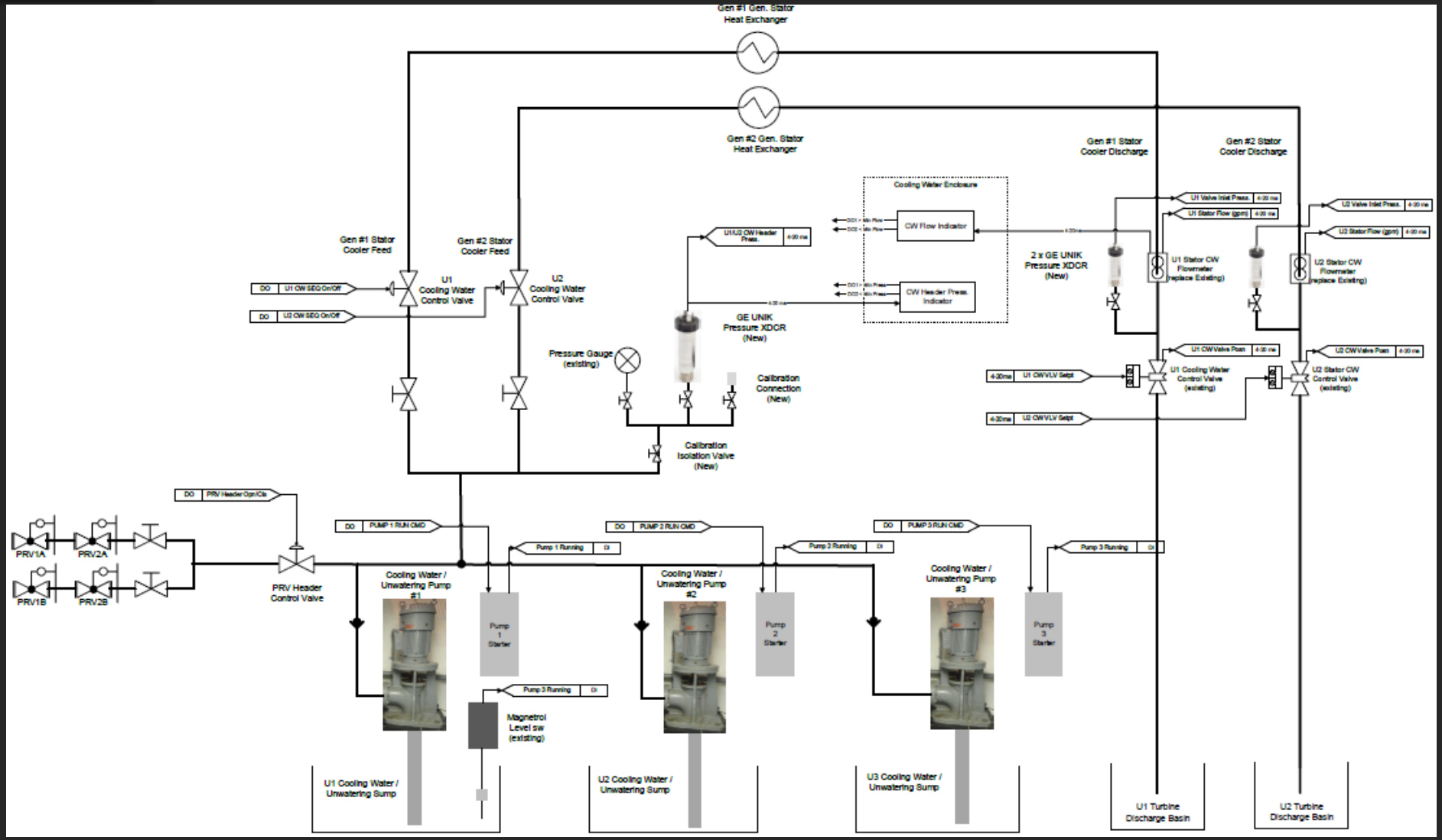


We are truly blind to the consequences of future summer and winter load growth without a load forecasting effort. Load forecasting is not an "answer" effort, it's a process effort that must be designed as you learn over several years. If the blind men in the cartoon communicate, they will figure it out…..

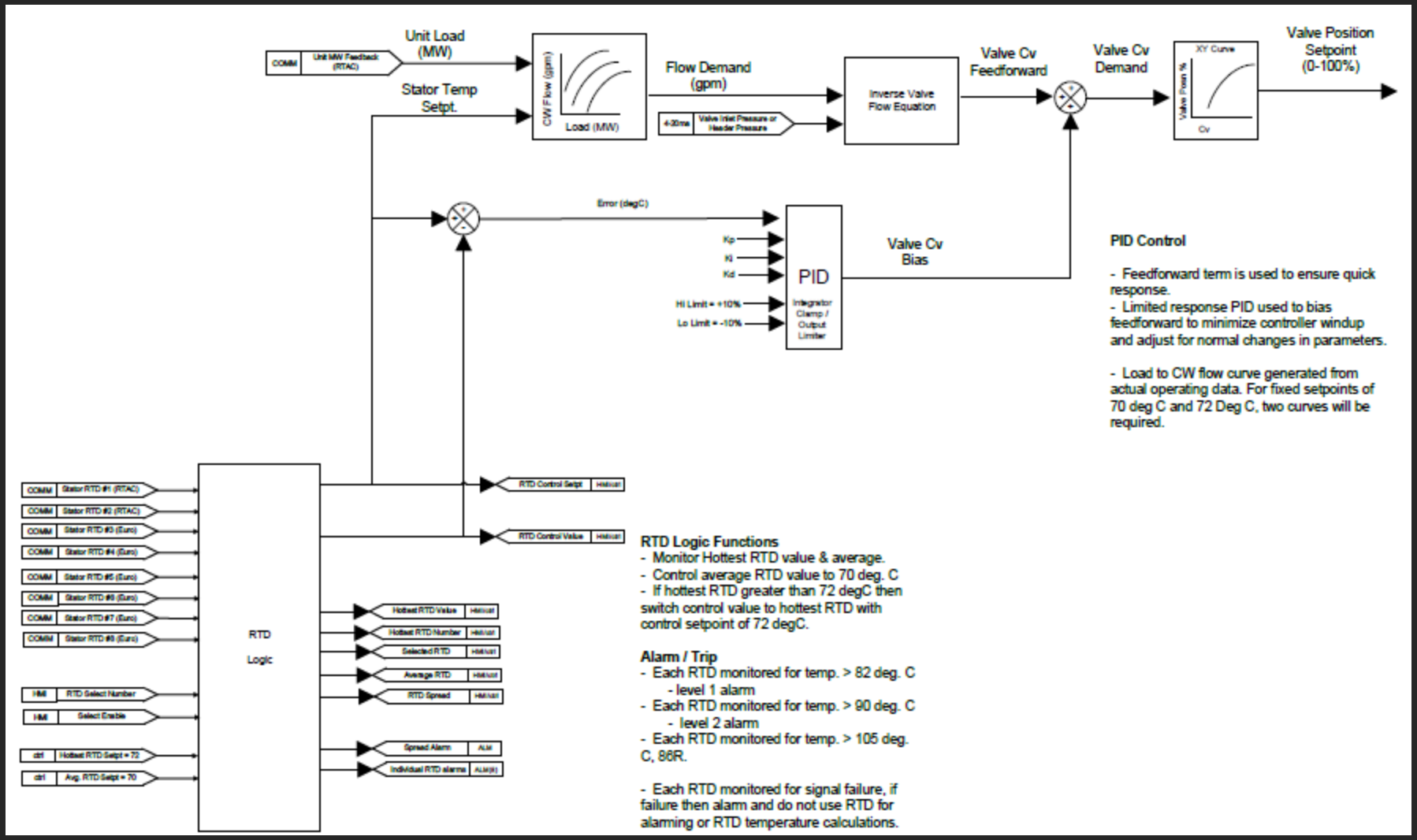
Alarm Control Protection Over-View



Alarm-Control-Protection



ACP- Cooling Water Control Design



PID Control

- Feedforward term is used to ensure quick response.
- Limited response PID used to bias feedforward to minimize controller windup and adjust for normal changes in parameters.

- Load to CW flow curve generated from actual operating data. For fixed setpoints of 70 deg C and 72 Deg C, two curves will be required.

RTD Logic Functions

- Monitor Hottest RTD value & average.
- Control average RTD value to 70 deg. C
- If hottest RTD greater than 72 degC then switch control value to hottest RTD with control setpoint of 72 degC.

Alarm / Trip

- Each RTD monitored for temp. > 82 deg. C
  - level 1 alarm
- Each RTD monitored for temp. > 90 deg. C
  - level 2 alarm
- Each RTD monitored for temp. > 105 deg. C, 86R.

- Each RTD monitored for signal failure, if failure then alarm and do not use RTD for alarming or RTD temperature calculations.

Swan Lake Reservoir Storage Increase

152 FERC ¶ 61,136
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Norman C. Bay, Chairman;
Philip D. Moeller, Cheryl A. LaFleur,
Tony Clark, and Colette D. Honorable.

Southeast Alaska Power Agency Project No. 2911-039

ORDER AMENDING LICENSE

(Issued August 18, 2015)

1. On July 21, 2014, the Southeast Alaska Power Agency (Agency), licensee for the Swan Lake Project No. 2911, filed an application to amend its license in order to install spillway gates on the project dam and raise the project reservoir. As discussed below, this order approves the Agency's amendment application.

Swan Lake Reservoir Storage Increase

We have an amended license, we have started permitting according to the conditions of the license:

- for construction- COE, best management plans for weeds and protection of Falls Creek
- Noxious weeds management plan and rare plant species protection and moving of rare plants
- Started talks with TNF on special use permit and the timber payment
- Adjudication of water rights

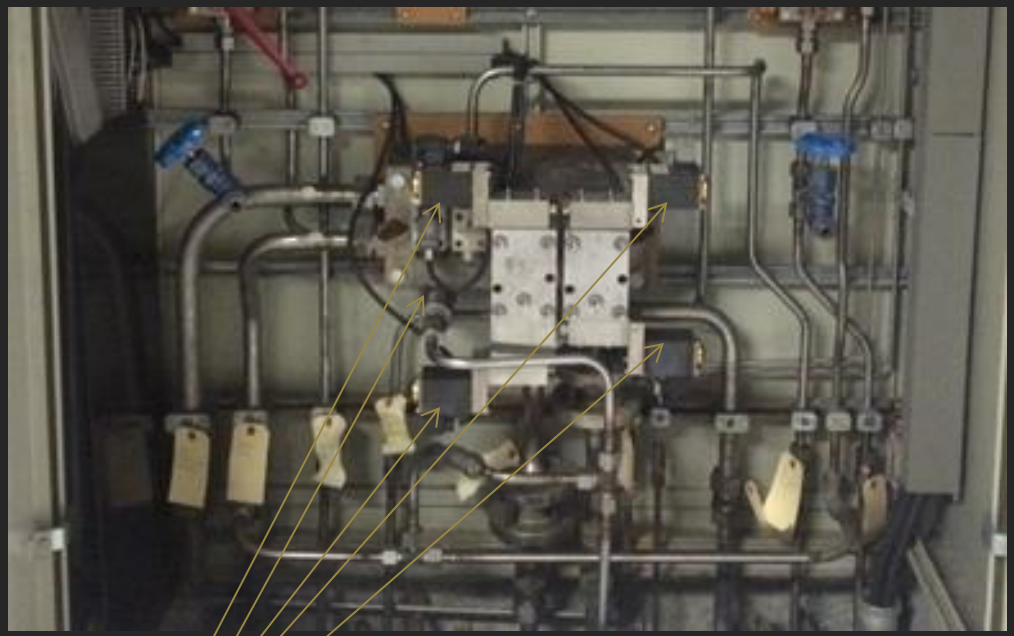
Swan Lake Reservoir Storage Increase

- We signed an agreement with McMillen-Jacobs and they have started final design of the non-flashboard elements
- We conducted the 30% design FERC PFMA meeting and received a couple of surprises
  - Intentional triggering of the flashboards to prevent over-topping during a flood is considered a sudden release of water and therefore a safety issue
  - FERC may ask us to periodically test the flashboards- remote chance is we do a good job of design and construction
- We are ready to issue an RFP for the design/fabricate of the flashboards

Tyee Spherical Valve-Controls

The HDR task order is complete, in addition to the items listed in the report (filter piping, spares, by-pass, shut down control mods) we need to repair pitting that is occurring on the cylinder

Tyee Spherical Valve-Controls



Each of the five control valves above cost approximately $10,000. We plan to issue a P.O. to replace the faulty valves and have 1 set of spares, this comes to nearly $100,000.

Tyee Spherical Valve-By Pass Valve Maintenance

This is actually tricky work; making a temporary by-pass valve that will not cavitate (due to 600 psi differential pressure).

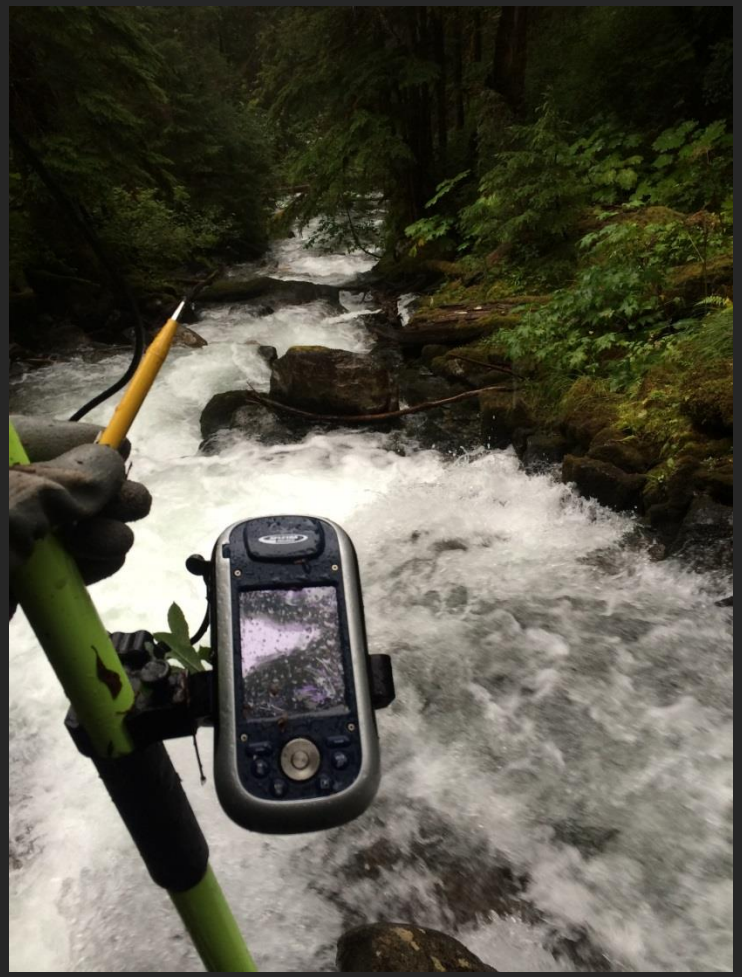
Solution- an orifice plate fabricated and welded at Tyee in series with a 300# class ball valve.

DCCED Grant- Hydro Site Investigation

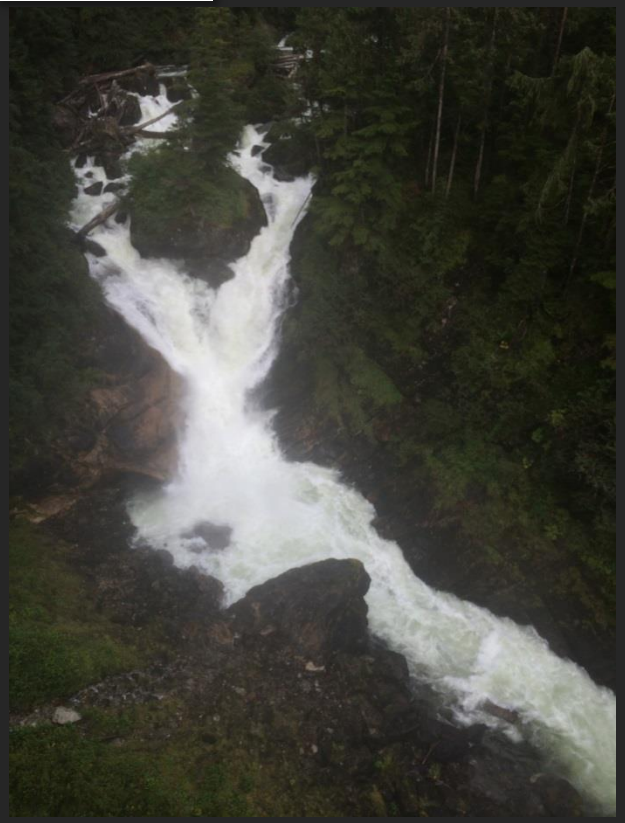
Summer field work- Anita Lake (shown above), Cabin and City Creek, Cascade Creek, Scenery Lake and Ruth

Anita and Kunk Lake Surveys

Mapped penstock routes, canal routes (Anita Outlet into Kunk), road feasibility, intake depths and applicability of siphon or lake tap, mapped depths of intakes. Noted LUD category and roadless rule restrictions.

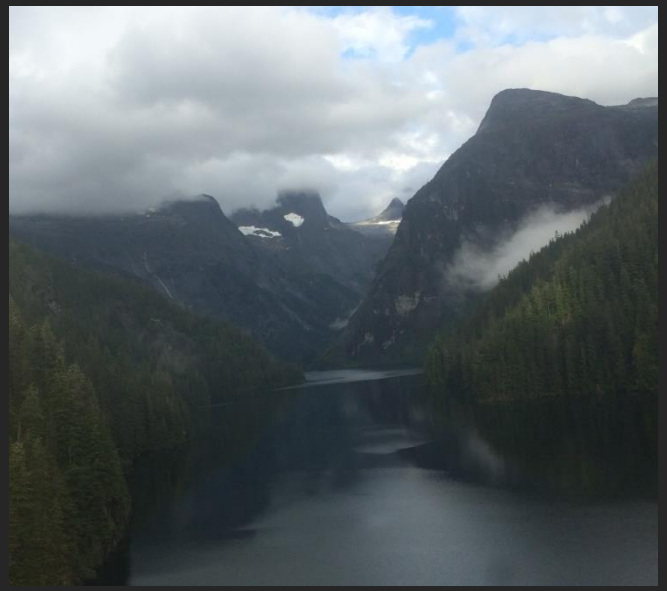


Scenery Lake Surveys



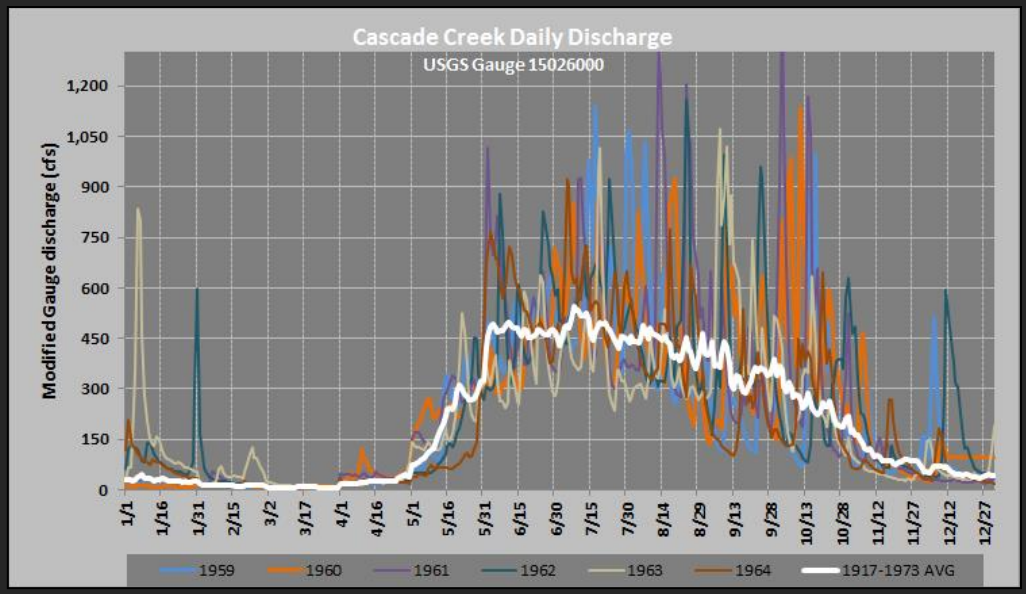
Fish Barrier is further upstream than anticipated from F&G map

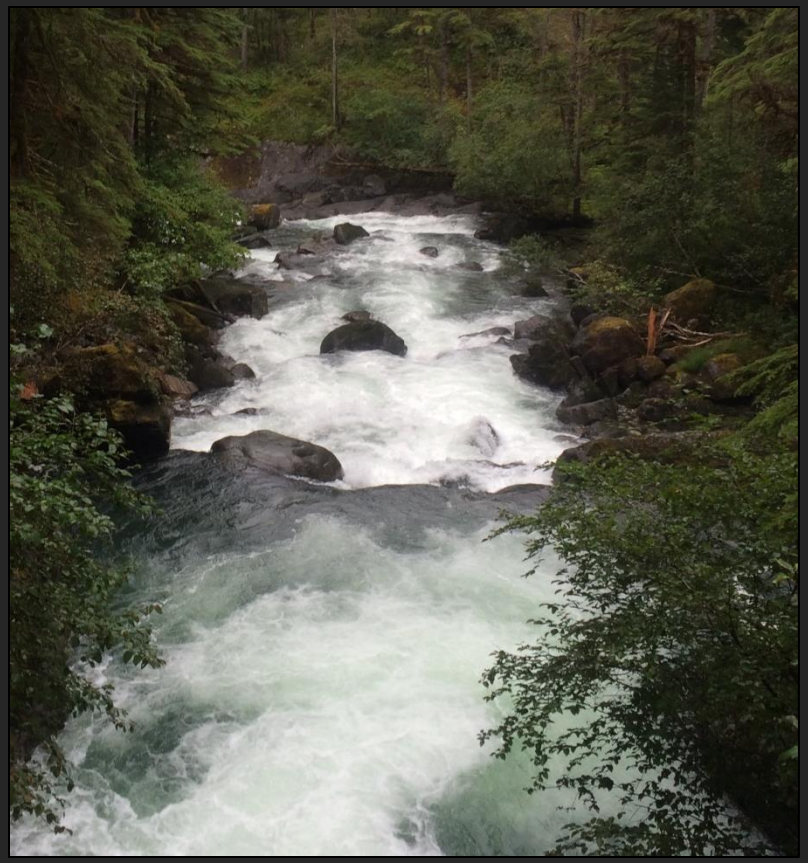
Surveying a potential penstock route, excellent habitat and countless salmon observed in side streams, and there is a reason it's called Scenery Lake



Hydro Site Investigation- Cascade Creek

Find a Staged Alternative to reduce the one time construction cost and idle asset- it's a huge resource, more head and more flow than Tyee. It needs a storage component





Hydro Site Investigation- Cascade Creek

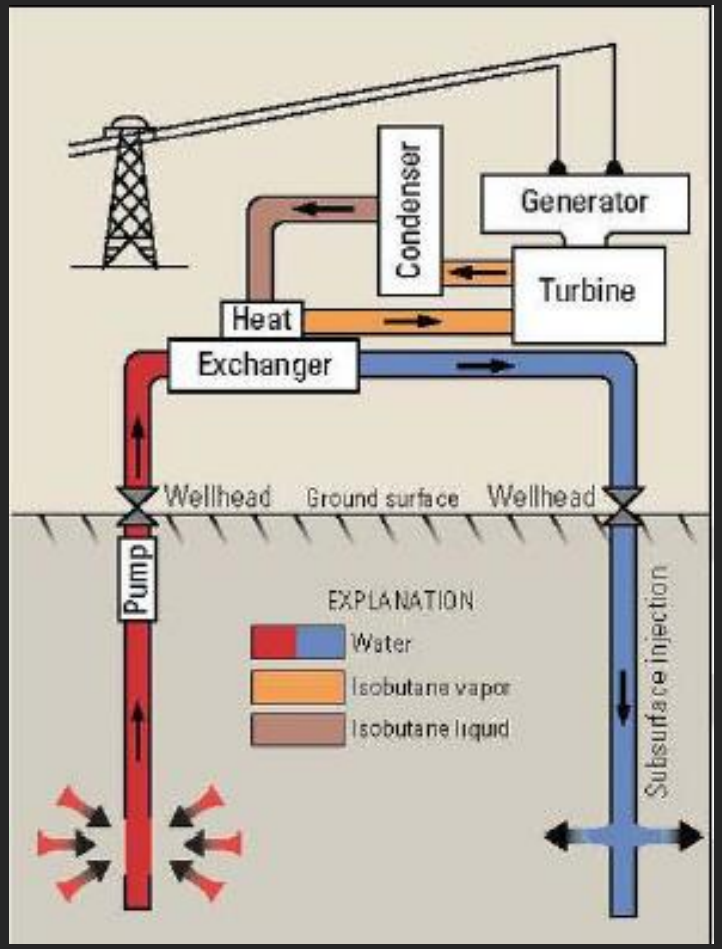
If possible find a site that supports a staged approach

Bell Island Preliminary Geothermal Evaluation

Bell Island – At our last Board Meeting

Power Balance: The field work, lab analysis, and modeling estimated the reservoir temperature (138°C) , an assumed source depth of 3000 ft, and surface area of 4 sq. mi yielded a gross output of 130 MW (red pipe) to deliver 5.3 MW.

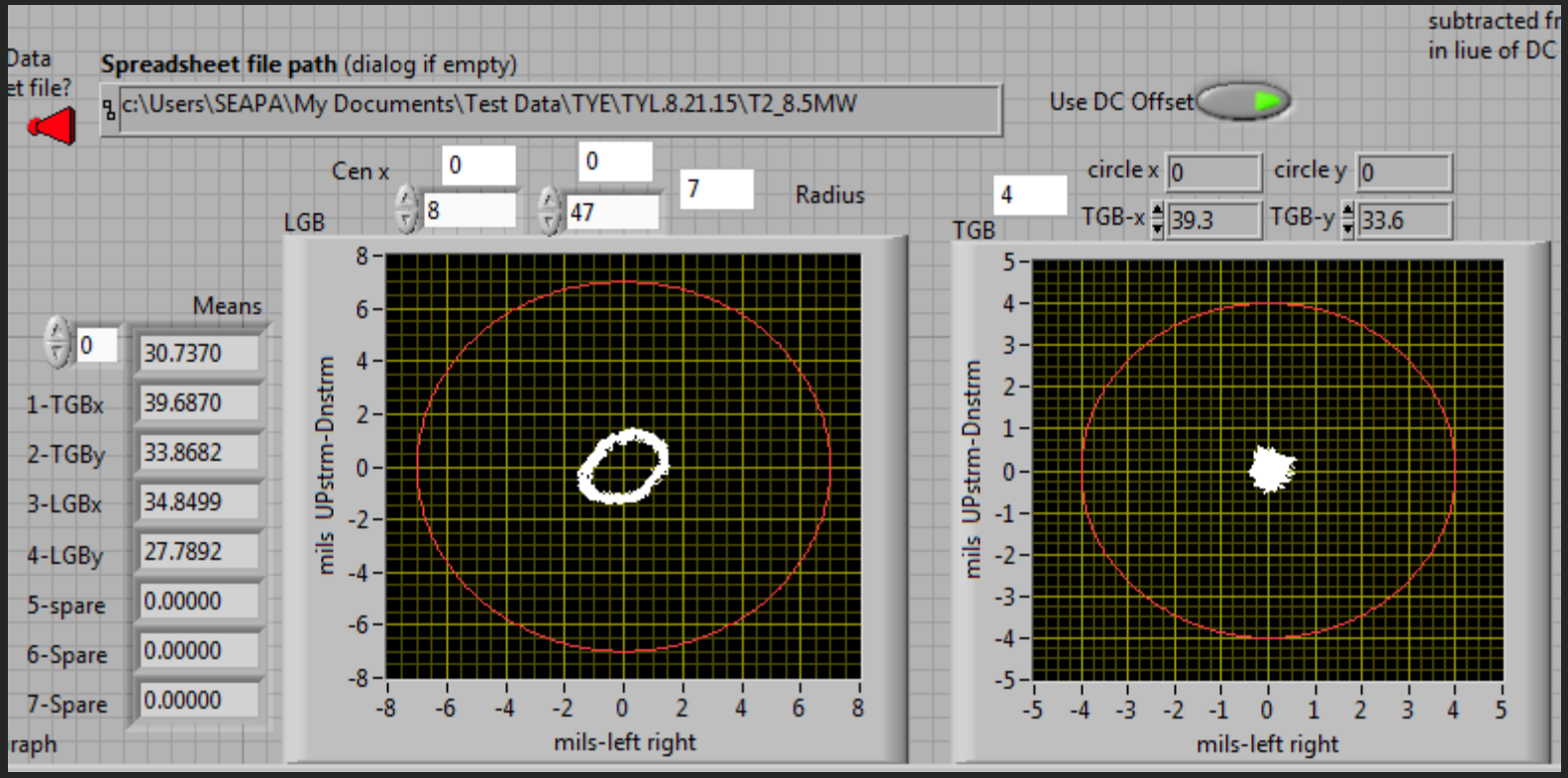
Nominal Size of Plant (MW)	9.5
Gross Electric Generation of Cycle (MW)	9.5
Geothermal water Delivery Temp (°C)	126
Geothermal water Exit Temp (°C)	43
System Efficiency (ref 1)	7.0%
Qh Heat Transfer (MW)	136
Ql Heat Transfer (MW)	126
Geothermal flow rate (total gpm)	6,566
Production well head (ft)	850
Production Well (kW)	1,410
Sea Water Condenser flow (gpm)	39,930
Sea Water Condenser pump head (ft)	173
Sea Water Condenser pump power (kW)	1,782
Injection Well Head (ft)	500
Injection well Power (kW)	824
Net Power to Export at STI (MW)	5.26
Gross system efficiency	3.9%



Tyee Unit Integrity- Vibration Testing

Randy Rasler and Eric Wolfe performed vibration testing on T2 during late August, Randy shown determining max shaft displacement relative to bearing walls, he also fabricated a special bracket for the UGB just under the slip ring collar

Tyee-Unit Integrity- Vibration Test



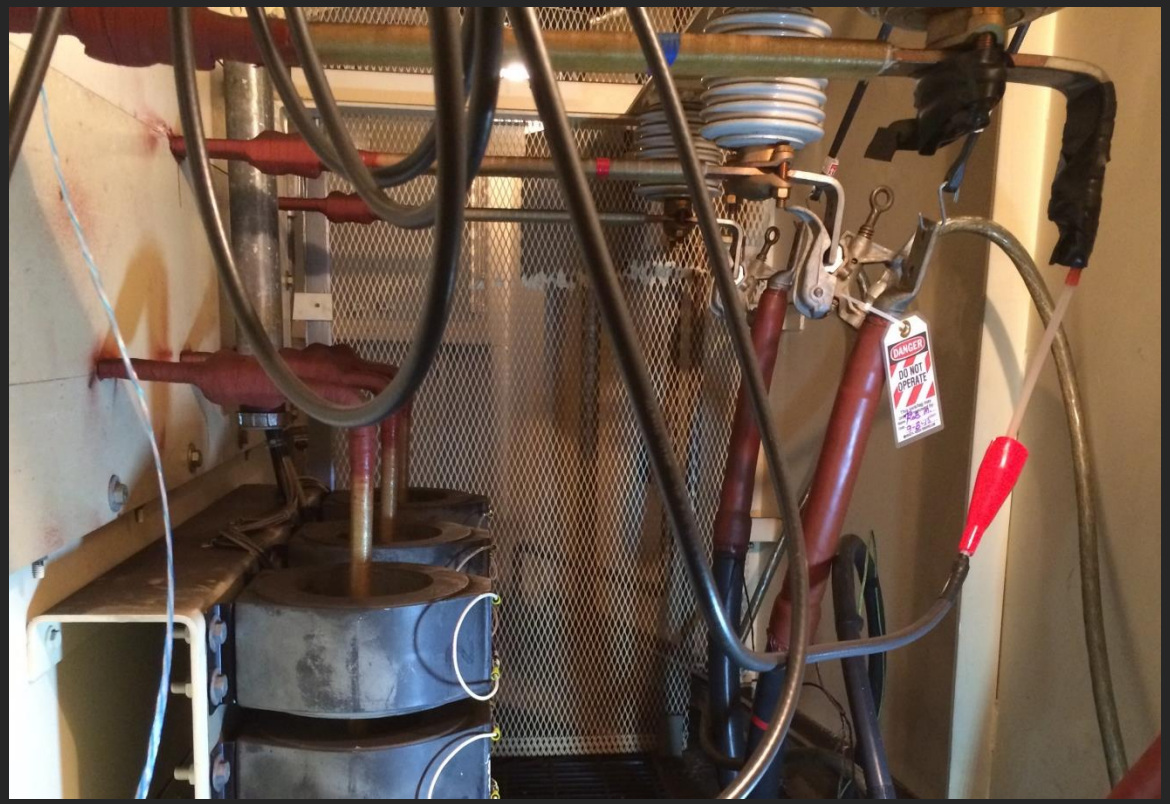
The scale is in 1/1000 inch (mils), note the field exhibits no out of round characteristic in the plot at right, and the shaft in the turbine guide bearing has a maximum zero to peak displacement of only 1.5 mils. Red circle indicate bearing walls. The machine is well under generator manufacturer vibration limits and has no characteristics for out of alignment, stator slip or warp, or nozzle unbalance. No difference with the deflector cut into the jet approximately 10%.

Swan Lake Unit Integrity- S1 DC High Pot Test

The whole idea is to conduct a go-no go test when you have time to rewind the generator, this removes core damage risk, and diesel generation risk. We signed a contingency agreement with Magnetech (Tyee rewind contractor) and conducted the test Sept 9th.

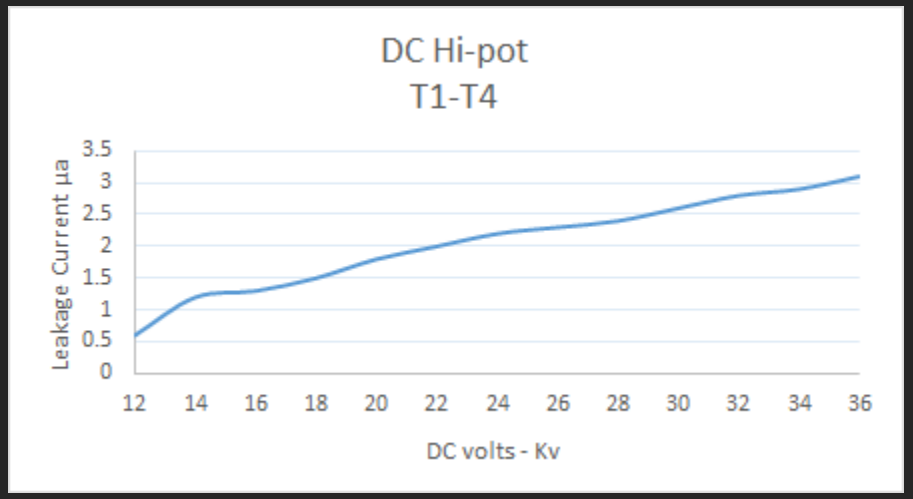
Swan Lake Unit Integrity- S1 DC High Pot Test

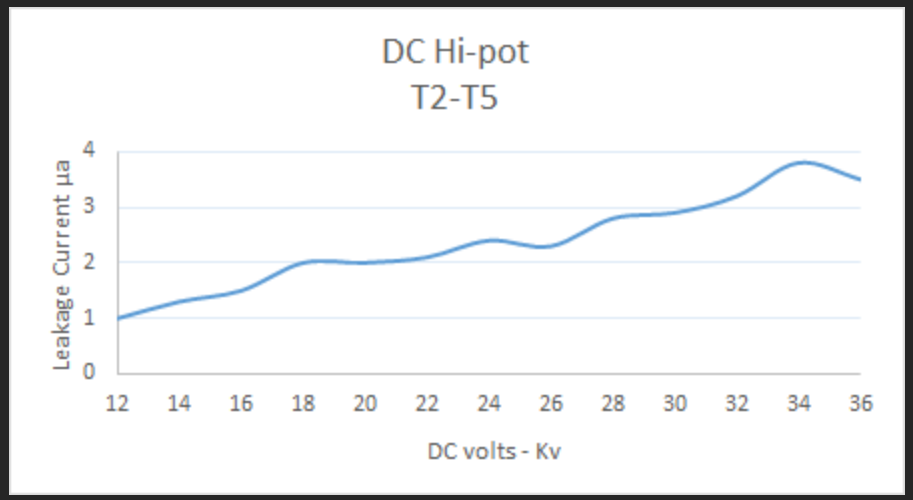
Test leads shown on right side of photo below, CT's terminals connected (white wires) to protect against surge fault on coils in the event of a test induced fault, test crew shown at right, one unit tested and put back together Wednesday, Sept 9th.

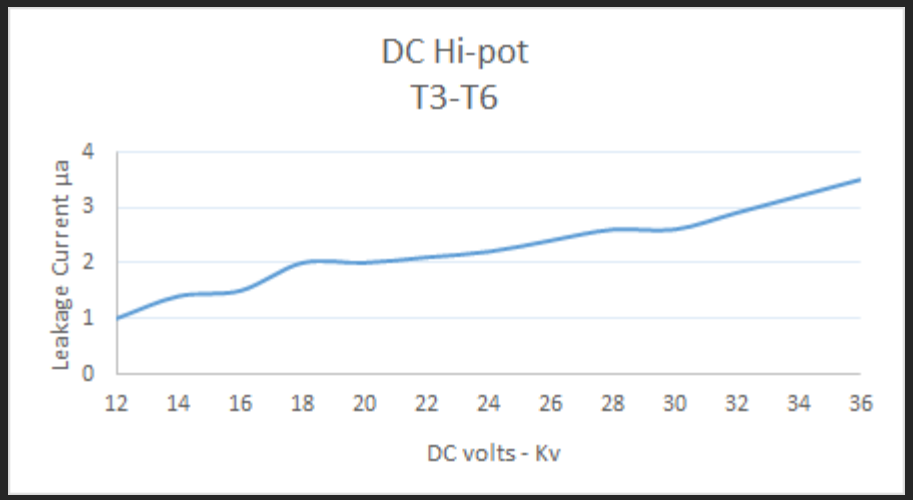


Swan Lake Unit Integrity- DC Hi Pot Results

All three phases exhibited great insulation resistance with leakage currents well below values expected for a 30 year winding; the resolution of the test meter gauge is +/- 1 µA. Summary- great result, will test again in 2020 with low risk of hi capacity operation. Very, very good news.

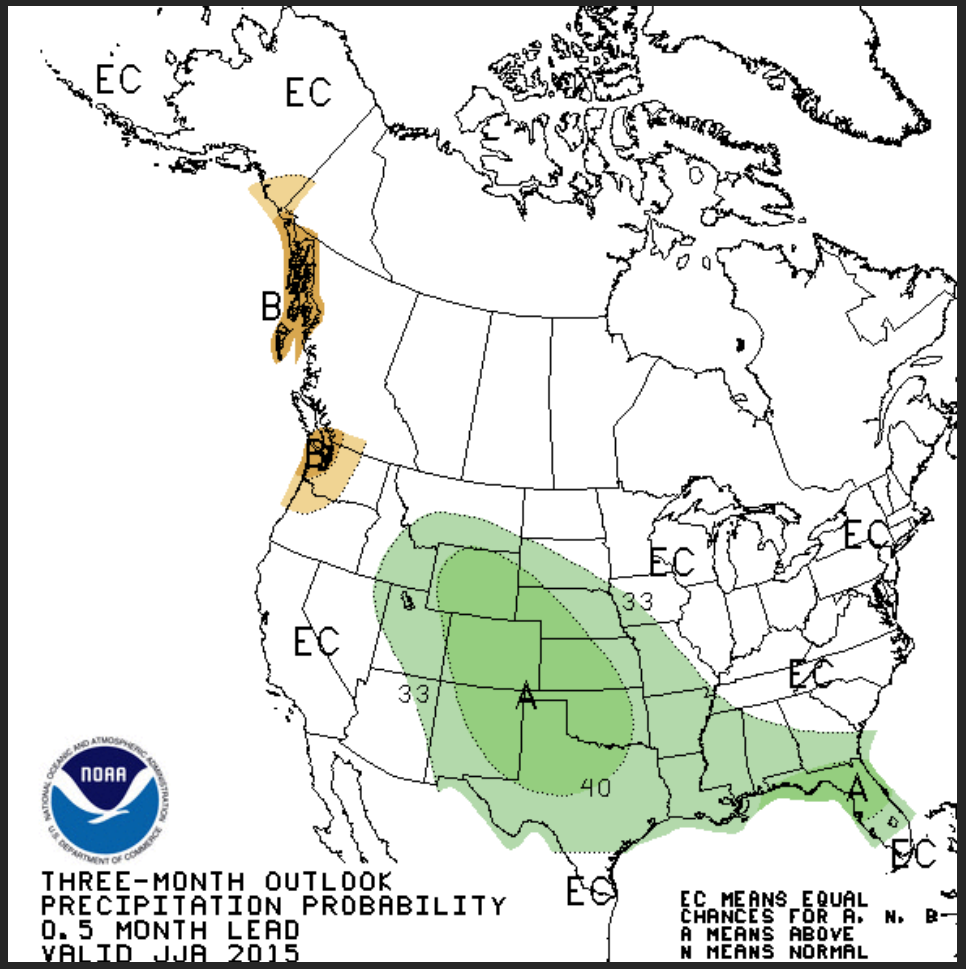






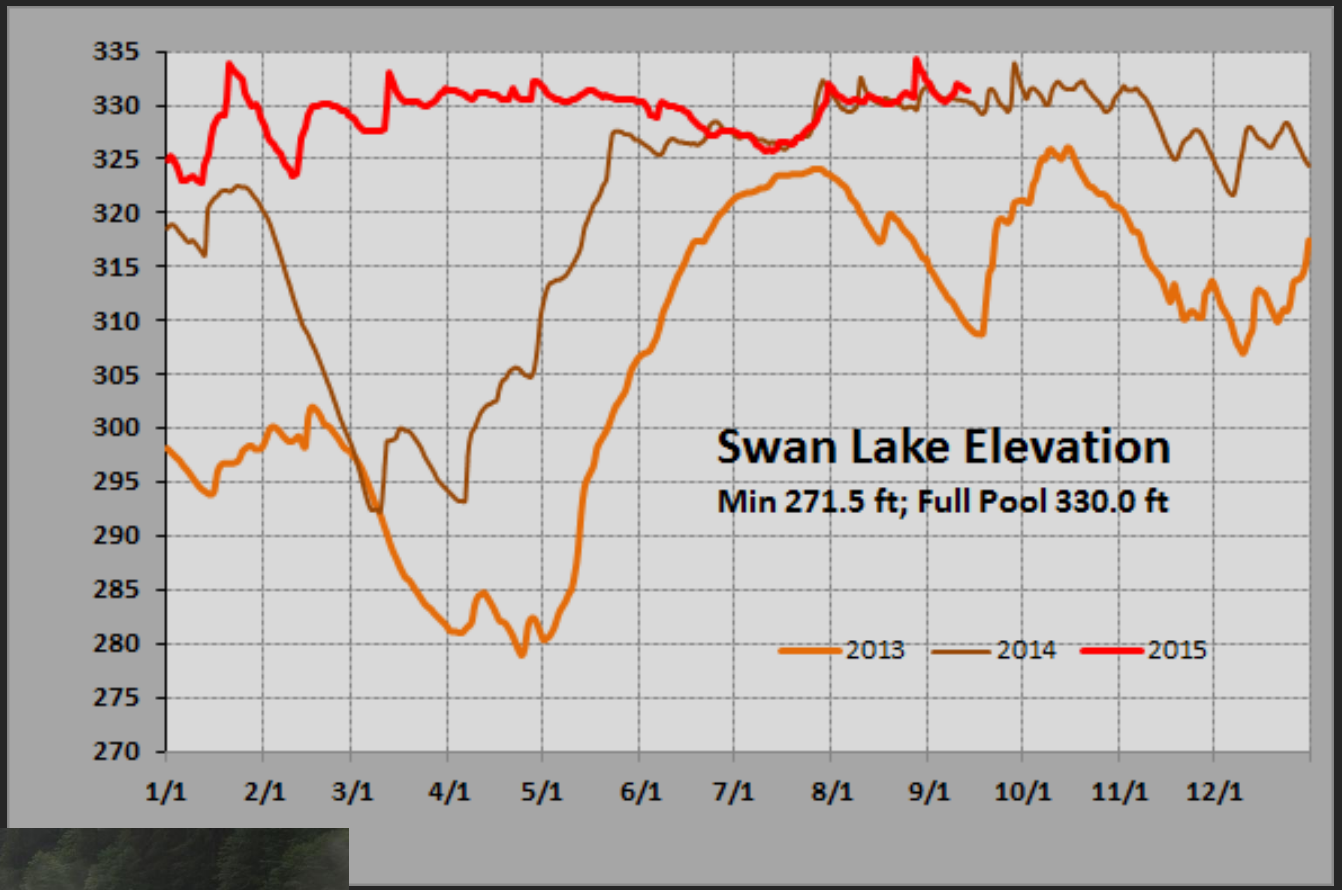
Water Management Discussion

It is difficult to imagine a dry summer right now, yet that is the forecast for summer 2015. A natural water management question would be" where will the reservoirs be if we have below normal precipitation this summer and fall, yet have a strong fish processing season, note once again we have an implied load forecast. For purposes of this discussion we'll assume 85% of the drier of 2013 or 2014 which comes to 81% of all inflow data. Loads were chosen to be from our peak 2013 summer, then 2014 loads up to November 30th.



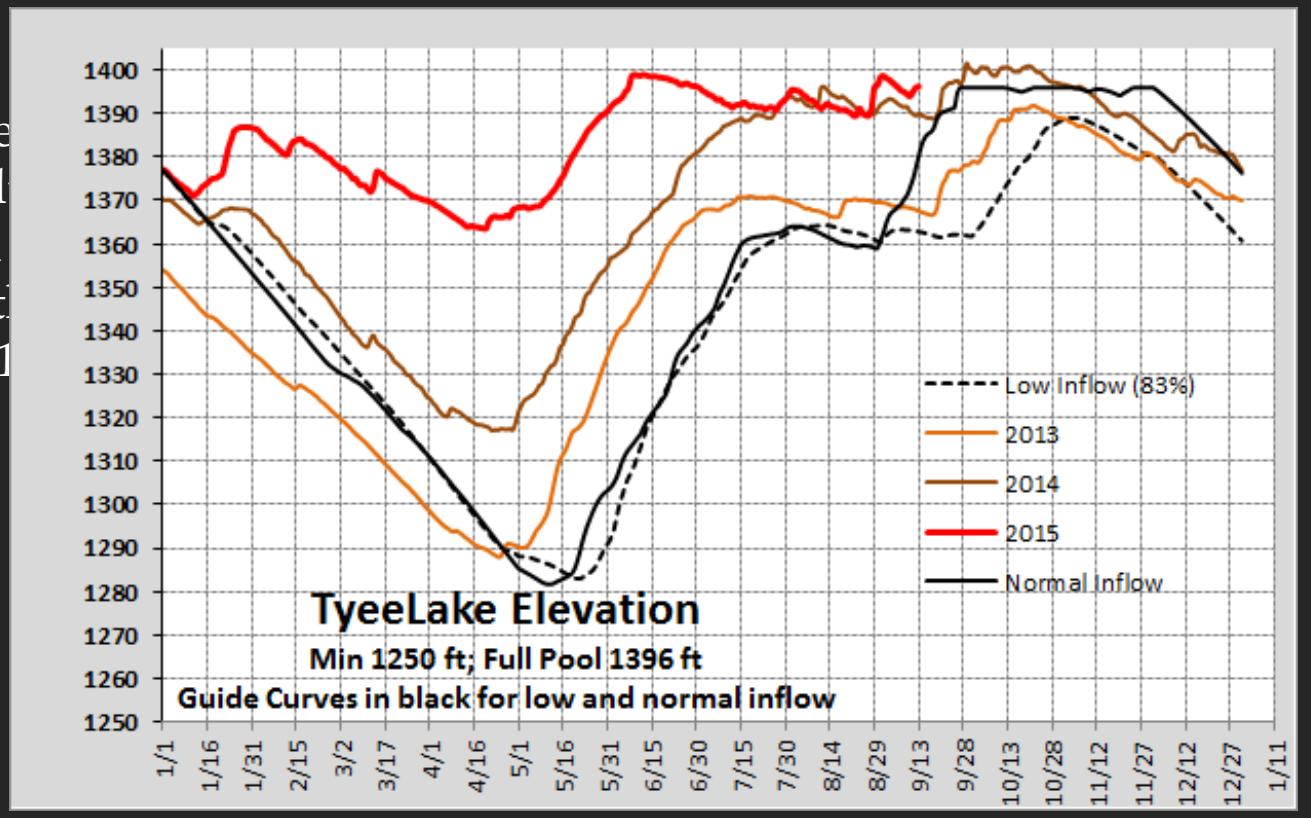
Water Management Discussion

Spill of course means the stored energy is lost, spill occurs at Elevation 330 ft. We have been spilling off & on at Swan Lake since January



Water Management Discussion

Spill occurs at and above
elevation 1392 at Tyee, d
to weir leakage, the spill
slot elevation is 1396 ft, t
elevation on Sept. 14, 201
was 1395.9, "pre-spill"



Questions