NON-TREATY STORAGE AGREEMENT

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Content:

- Background/Review
- Renegotiation Outcomes
- Stakeholder Feedback and Comments
- Next Steps

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Background/Review

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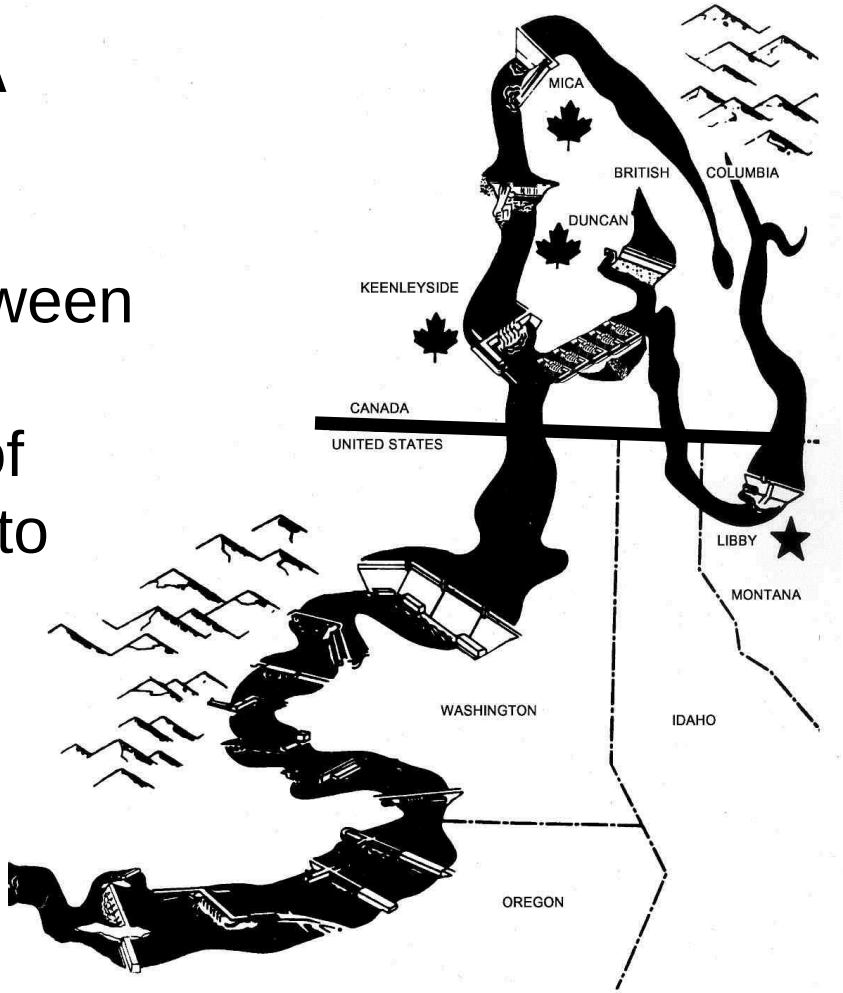
COLUMBIA RIVER TREATY

WHAT IS THE COLUMBIA RIVER TREATY?

An international Treaty between Canada and the US, to coordinate the operations of Canadian storage projects to maximize power and flood control benefits.



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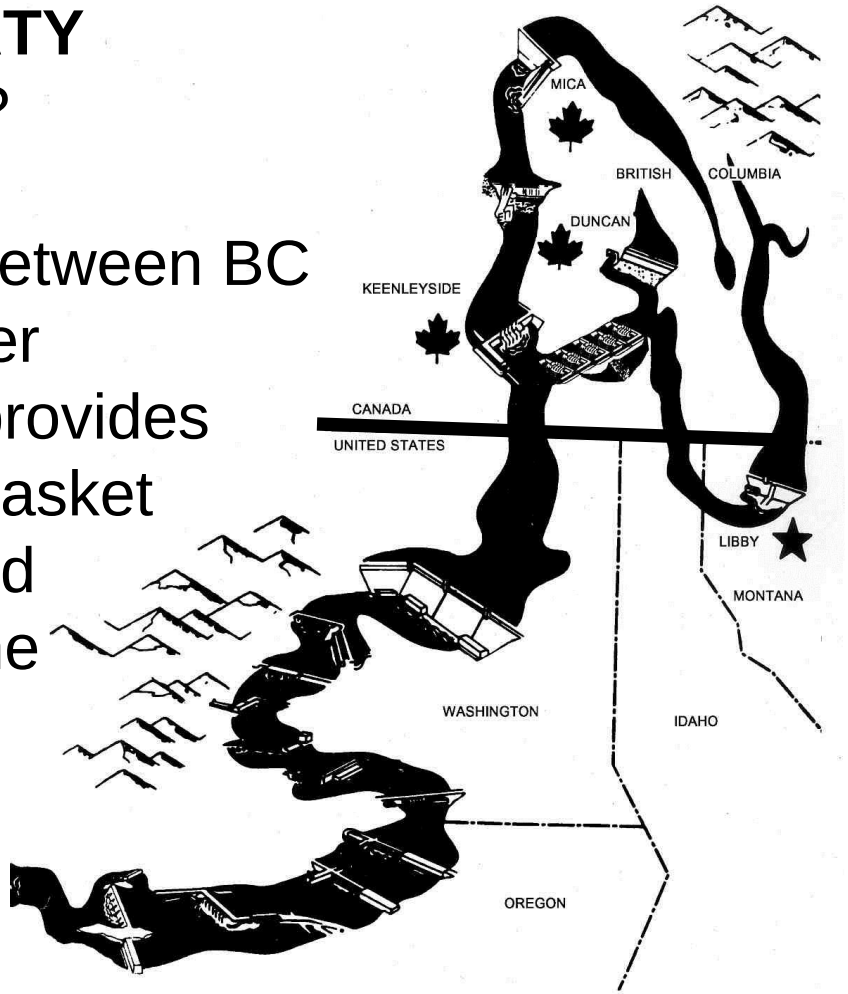
Non-Treaty Storage Agreement

WHAT IS THE NON-TREATY STORAGE AGREEMENT?

A commercial agreement between BC Hydro and Bonneville Power Administration (BPA) that provides further coordination of Kinbasket and Arrow reservoir, beyond that which is provided by the Columbia River Treaty.



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Treaty vs. Non-Treaty

Treaty:

- International Treaty
- Entities: BC Hydro (BCH), Bonneville Power Administration (BPA) and the US Army Corp of Engineers (COE)
- 15.5 million acre feet (MAF) of storage operated under a set of rules (at Mica, Arrow, and Duncan)

Non-Treaty Storage Agreement:

- Bilateral agreement between BCH and BPA
- An enabling agreement that provides for up to 5 MAF of storage operated by mutual agreement (at Mica, but also affects Arrow)

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Other Points Related to NTS

- Columbia River Treaty:
  - Treaty Operations result is physical outcome
  - NTS operations used to adjust the physical outcome
  - Actual Treaty Operation is not changed
- Water Use Plan:
  - Operational modeling in WUP included 1990 Non-Treaty Storage Operation (4.5 MAF)
  - WLR program ($120M) tailored to reservoir operations with 4.5 MAF Non-Treaty Storage Operations.
- Regulatory Approvals:
  - None required for an Agreement.
  - Reservoir/Plants operate within their Water Licences

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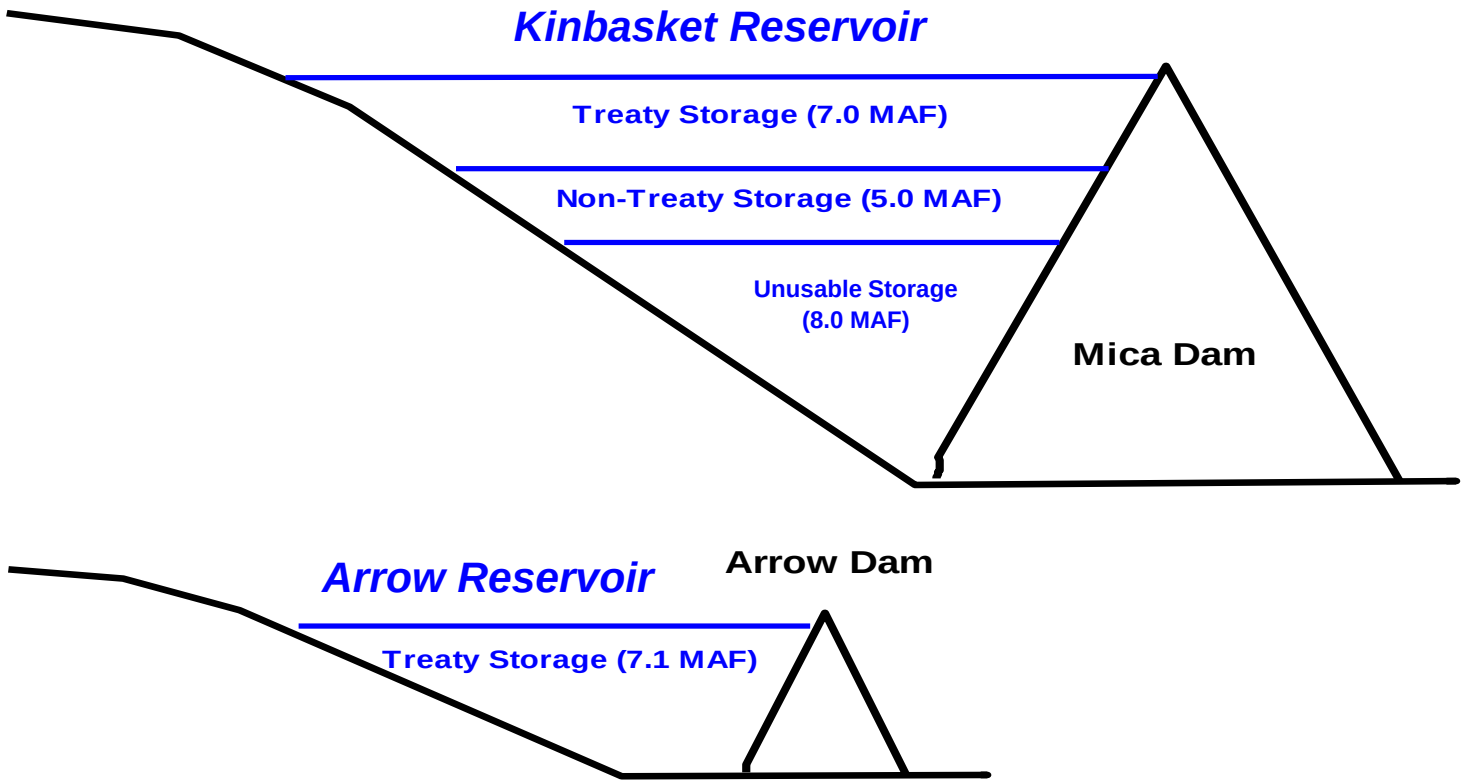
Storage at Mica and Arrow



1 MAF = top 10 feet at Kinbasket

1 MAF = top 8 feet at Arrow

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Non-Treaty Storage Utilization Scenarios

Four different strategies for utilizing Non-Treaty Storage:

- Scenario A: High Potential Utilization (4.5 MAF Max)
- Scenario B: Mod Potential Utilization (3.0 MAF Max)
- Scenario C: Low Potential Utilization (2.0 MAF Max)
- Scenario D: No Utilization

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Performance Measures (PM's)

- A tool for evaluating impact of operating Scenarios on non-power interests/values
- Origin of Performance Measures:
  - Most developed during the WUP
  - WUP Sub-committees formed for each interest area
- NTSA Process
  - WUP PM's updated
  - New PM's developed based on local knowledge & interests, and new study data

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Performance Measure List

KINBASKET, REV & MCR

- Navigation
- Recreation
- Heritage
- Erosion
- Vegetation
- Dust
- Fish (Pelagic)
- Entrainment

- REV Productivity

- MCR Recreation
- MCR Aquatics
- MCR Wetlands

ARROW

- Navigation
- Recreation
- Heritage
- Vegetation
- Wildlife
- Dust
- Pelagic Productivity
- Entrainment

Soft Constraints

- Recreation
- Fish
- Heritage
- Erosion
- Vegetation
- Wildlife

LOWER COL RIVER

- LCR Recreation
- LCR Flooding
- TGP
- Whitefish

SYSTEM WIDE

- Power (Cost)
- GHG

Consequence Table

Objective	Attribute	Direction	Units	MSIC Type	MSIC Val	A (Full Utilization)	B (Moderate & Flex)	C (Low Utilization)	D (none)
Kin - Navigation	Total site-days / year (Downie)	H	days	A	7	343	346	350	360
Kin - Rec - Water - Canoe	2404 < days < 2475	H	days	A	7	150	151	155	168
Kin - Rec - Water - Columbia	2375 < days < 2475	H	days	A	7	174	175	176	181
Kin - Rec - Shore - Columbia	2444 < days < 2473	L	days	A	7	50	44	45	46
Kin - Heritage	Weighted days - Erosion	L	days	A	7	205	206	213	233
Kin - Heritage	Weighted days - Inundation	H	days	A	7	507	522	543	601
Kin - Vegetation	Flooded Weeks (early; 749-751m)	L	weeks	R	10%	2.20	2.30	2.40	3.10
Kin - Dust	SqKm - Days (April)	L	sqkm-days	R	10%	1,500	1,490	1,410	1,300
Kin - Erosion	days >= 2470	L	days	A	7	52	61	64	76
Kin - Pelagic Productivity	Mm3-Days	H	Mm3-days	R	10%	0.84	0.84	0.85	0.86
Rev Reservoir - Stability	0.25m over 1-day rolling	L	rolling days	R	10%	210	227	212	204
Mid-Col - Rec - Boat Access	days > 1435	H	days	A	7	36	30	36	71
Mid-Col - Rec - Shore Access	days < 1435	H	days	A	7	146	151	145	109
Mid-Col - Wetlands	Flooded Weeks - Montana - Fall	L	weeks	R	10%	5.00	5.10	5.60	14.20
Mid-Col - Wetlands	Flooded Depth (m) - Montana - Fal	L	metres	R	10%	1.40	1.20	1.40	2.10
Mid-Col - Aquatic - River Length	kilometres - October	H	km	R	10%	24.90	24.10	24.10	16.60
Mid-Col - Sturgeon - WUA	% time > 200 m2	H	percent	R	10%	76%	75%	77%	83%
Arr - Fish - Pelagic	Mm3-Days	H	Mm3-days	R	10%	1.78	1.78	1.79	1.82
Arr - Fish - Entrainment	to come	H	days	A	7	0	0	0	0
Arr - Rec	Weighted days	H	days	A	7	221	220	229	257
Arr - Heritage	Weighted days - Erosion	L	days	A	7	212	209	216	262
Arr - Heritage	Weighted days - Inundation	H	days	A	7	129	115	136	221
Arr - Dust	days < 1410	L	days	A	7	43	42	43	28
Arr - Vegetation	Flooded Weeks (latter; 436-437)	L	weeks	R	10%	3.50	3.70	3.90	10.70
Arr - Wildlife	% Useabe Habitat - Nesting	H	percent	R	3%	6%	12%	6%	1%
Arr - Wildlife	% Useabe Habitat - Fall Migration	H	percent	R	4%	30%	28%	24%	1%
Arr - Navigation	Weighted-Days	H	days	A	7	221	220	229	257
LCR - Boat Access	40000 < days < 103000	H	days	A	7	61	60	61	64
LCR - Shoreline Access	60000 < days < 99000	H	days	A	7	87	87	87	92
LCR - Flooding at Genelle	days > 165 kcfs	L	days	A	n/a	0	0	0	0
LCR - Whitefish	% Egg Loss	L	percent	R	10%	22%	22%	22%	16%
LCR - TGP	days > 115%	L	days	R	10%	36	31	38	82
Power Generation	Incremental Cost	L	$M/yr	A	0.5	$ 0.00	$ 0.10	$ 0.60	$ 11.80
Greenhouse Gas	Incremental Carbon Benefit	H	Ktonnes/yr	R	10%	171	153	176	0

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Consequence Table

Objective	Attribute	Direction	Units	A (Full Utilization)	B (Moderate & Flex)	C (Low Utilization)	D (none)
Arr - SC - Recreation	1435 < days < 1440	H	days	26	22	27	63
Arr - SC - Fish	days > 1430	H	days	53	47	53	116
Arr - SC - Vegetation (early)	days > 1424 (may-july)	L	days	57	54	58	58
Arr - SC - Vegetation (late)	days > 1424 (aug - sept)	L	days	42	40	45	55
Arr - SC - Heritage	days <= 1430	H	days	280	288	277	202
Arr - SC - Erosion	days >= 1440	L	days	9	7	9	8
Arr - SC - Wildlife (nesting bird)	days < 1424	H	days	34	37	34	34
Arr - SC - Wildlife fall migrants)	days < 1437	H	days	85	85	85	58

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First Nations Consultation

- Meetings with First Nations on similar timetable to Public Stakeholder Sessions.
- Key concerns expressed:
  - Heritage/Archeology:
    - Lack of archaeology inventory.
  - Canadian Fisheries:
    - Kokanee and Sturgeon
  - US Fisheries:
    - Strong support for US efforts for recovery of salmon stocks
    - Return of salmon to Canadian Columbia river.

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Renegotiation Outcome

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NTSA Renegotiation Objectives

Objectives: To secure an agreement with the US that will:

- Optimize additional power and non-power benefits for BC Hydro
- Improve control of Kinbasket/Arrow reservoir levels
- Support the system capability to meet existing Columbia Water Use Planning objectives.
- Extend to maximum of 2024, with short notice termination to protect from negative implications of sudden regulatory or other changes.

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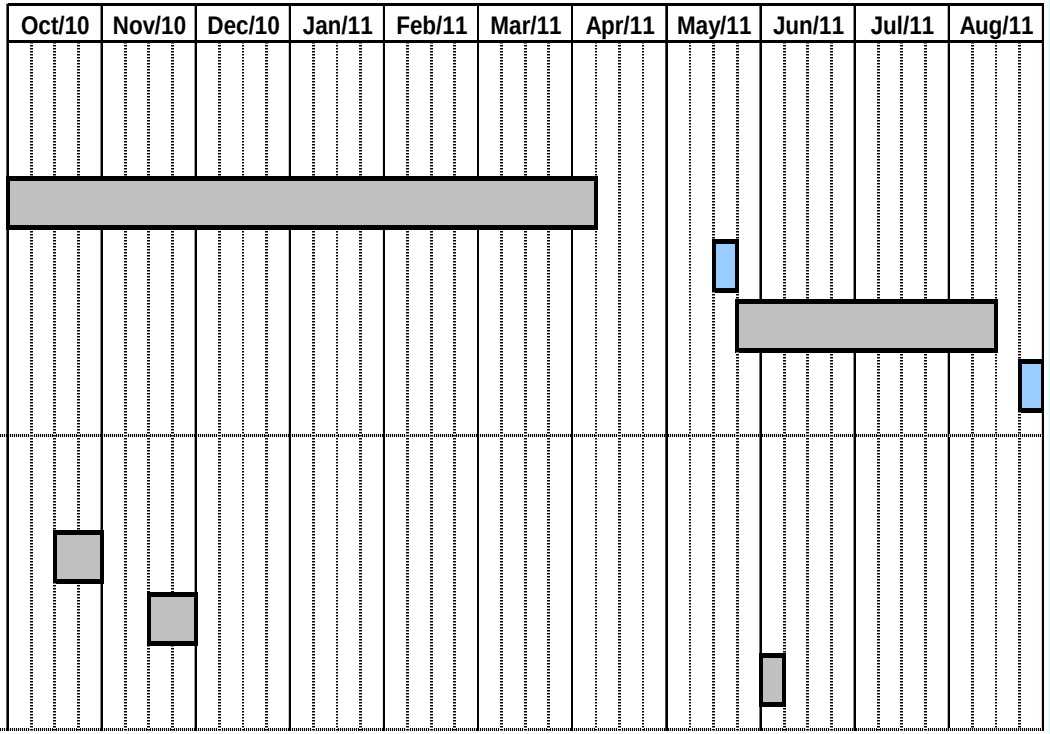
Negotiation Process

NTSA Re-Negotiations 2010/2011

Schedule



Negotiations:

Term Sheet Negotiation

Term Sheet Approval by BCH Board

Final Contract Preparation/Negotiation

Final Contract Approval

Public Engagement:

Meeting 1: Operational Data Reviews

Meeting 2: Enviro Data Reviews

Meeting 3: Report Back

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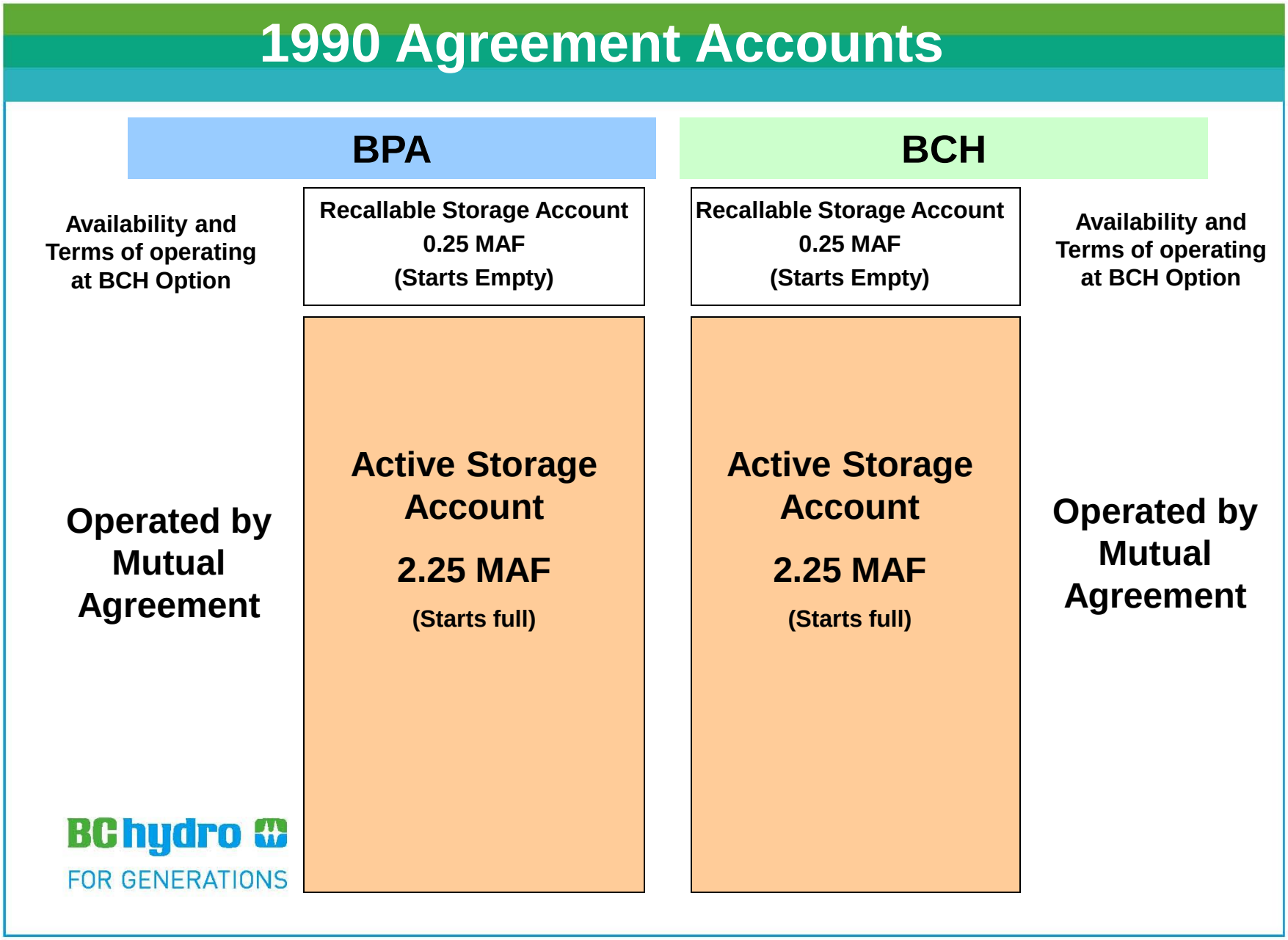
1990 Agreement Accounts



2011 Term Sheet Accounts

	BPA	BCH	
Availability and Terms of operation, at BCH Option	Recallable Storage Account 0.25 MAF (Starts Empty)	Recallable Storage Account 0.25 MAF (Starts Empty)	Availability and Terms of operation, at BCH Option
Operated by Mutual Agreement	Active Storage Account 1.5 MAF (Starts full)	Active Storage Account 1.5 MAF (Starts full)	Operated by Mutual Agreement
Availability and Terms of operation, at BCH Option	Recallable Release Account 0.75 MAF (Starts Full)	Recallable Release Account 0.75 MAF (Starts Full)	Availability and Terms of operation, at BCH Option

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BPA Release Option

- 0.5 MAF release in May/June, under low runoff conditions.
  - ~15% to 20% chance of occurring.
- Can only be released out of Active Storage
- Driven by US Biological Opinion
  - Objective: To help migration of salmon smolt to the ocean.

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BC Hydro Release Option

- 2 kcfs release in October – April, under dry conditions:
  - ~15% to 20% chance of being triggered
- Can be released out of both Active and Lower Recallable Storage
- Option to release water will qualify as a firm resource to serve domestic load
- Benefits:
  - About 1,080 GWh/year of firm energy.
    - 5 Pingston Creeks, 20 Akolkolex
  - Reduced requirement for procurement of new resources.

1990 Agreement Vs 2011 Term Sheet

Description	1990 Agreement	2011 Term Sheet
Active Storage	2.25 MAF each	1.5 MAF each
BPA Release Right	2 kcfs applied to full 2.25 MAF	0.5 MAF limited to 1.5 MAF Active Account (under dry conditions)
BCH Release Right	2 kcfs applied to full 2.25 MAF	2 kcfs applied to full 2.25 MAF (under dry conditions)
Early Termination	Trigger: •Loss of essentially all benefits: Refill: Up to 11 yrs	Trigger: •Material reduction in benefits •WUP/Biop changes Refill: 2 – 3 years
Initial and Final Termination:	Initial Termination, then a 7 year refill period	No Initial Termination.
BCH Firm Energy (potential IPP project deferrals)	850 GWh	1080 GWh

Stakeholder Feedback and Comments

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Stakeholder Feedback – Acct Size

Feedback:

1. 2.0 MAF Provides majority of power benefits
2. 4.5 MAF provides the greatest flexibility

Comment:

The proposed Terms have flexibility to:

- Capture majority of power benefits.
- Balance conflicting objectives as contemplated in the WUP

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Stakeholder Feedback – Control

Feedback:

3. Refill Provisions desirable

4. Concern over 0.5 MAF for BPA in low flow years

Comment :

- BPA limited to 1.5 MAF
- BPA 2 kcfs release right is gone.
- BPA will be forced to operate in the mid-range of their account to preserve flexibility to meet obligation to store or release in freshet
- Term Sheet includes improved contract termination and refill provisions

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Stakeholder Feedback – values

Feedback:

5. US appear to place higher value on meeting environmental and social objectives

Comment :

- ESA legislation in the US is a major controlling factor
- SARA in Canada
- Headwater reservoirs typically draft first

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Stakeholder Feedback – managing impacts

Feedback:

6. Specific Interests on Arrow and Kinbasket identified
7. Targets for reservoir Operations desirable
8. Avoid multi-year impacts

Comment:

- Flexibility available to balance impacts across competing objectives
  - System Flexibility
  - NTS flexibility
- WLR physical works programs augment operational adjustments

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Stakeholder Feedback – Additional Responses

Feedback:

9. Benefits of using Performance Measures

10. Desire for improved communications

Comment:

- BC Hydro has an improved understanding of stakeholder interests.
- Opportunity to improve communications across a wider range of topics on both reservoirs.

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Next Steps

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Review of Interests

- Non-Treaty Storage process looked at a variety of interests
- Broad extent of issues are being dealt with through WLR programs.
- Exceptions identified:
  - Heritage issues (particularly on Kinbasket)
  - Valemount dust issue

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Kinbasket Heritage Issue

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Kinbasket Heritage

- Significant void in archaeology inventory on Kinbasket:
  - Arrow: significant gaps.
  - Kinbasket: near complete lack of inventory.
- Reservoir Archaeology Program (RAP):
  - Arrow scheduled for next year
  - Kinbasket scheduled for 2020+
- Kinbasket Archaeology studies are being moved up to 2012-2014

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Valemount Dust Issue

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Air Quality Data from Valemount

- Air quality monitor at the Valemount Fire hall.
- 10 years of data
- Sampling on 3 day time-steps
- Sample size:
  - PM10: very fine dust
  - PM2.5: extremely fine, typically resulting from combustion.

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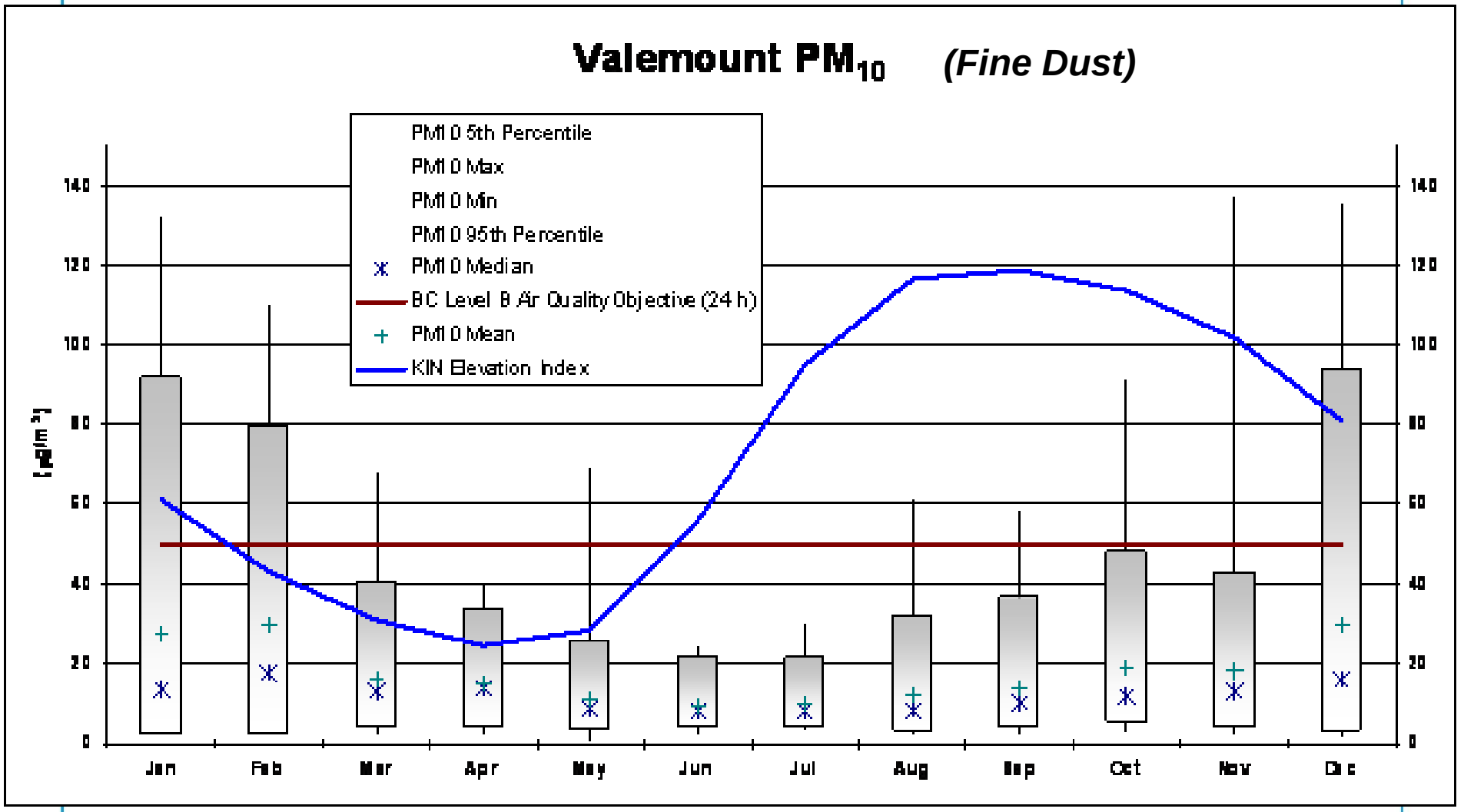
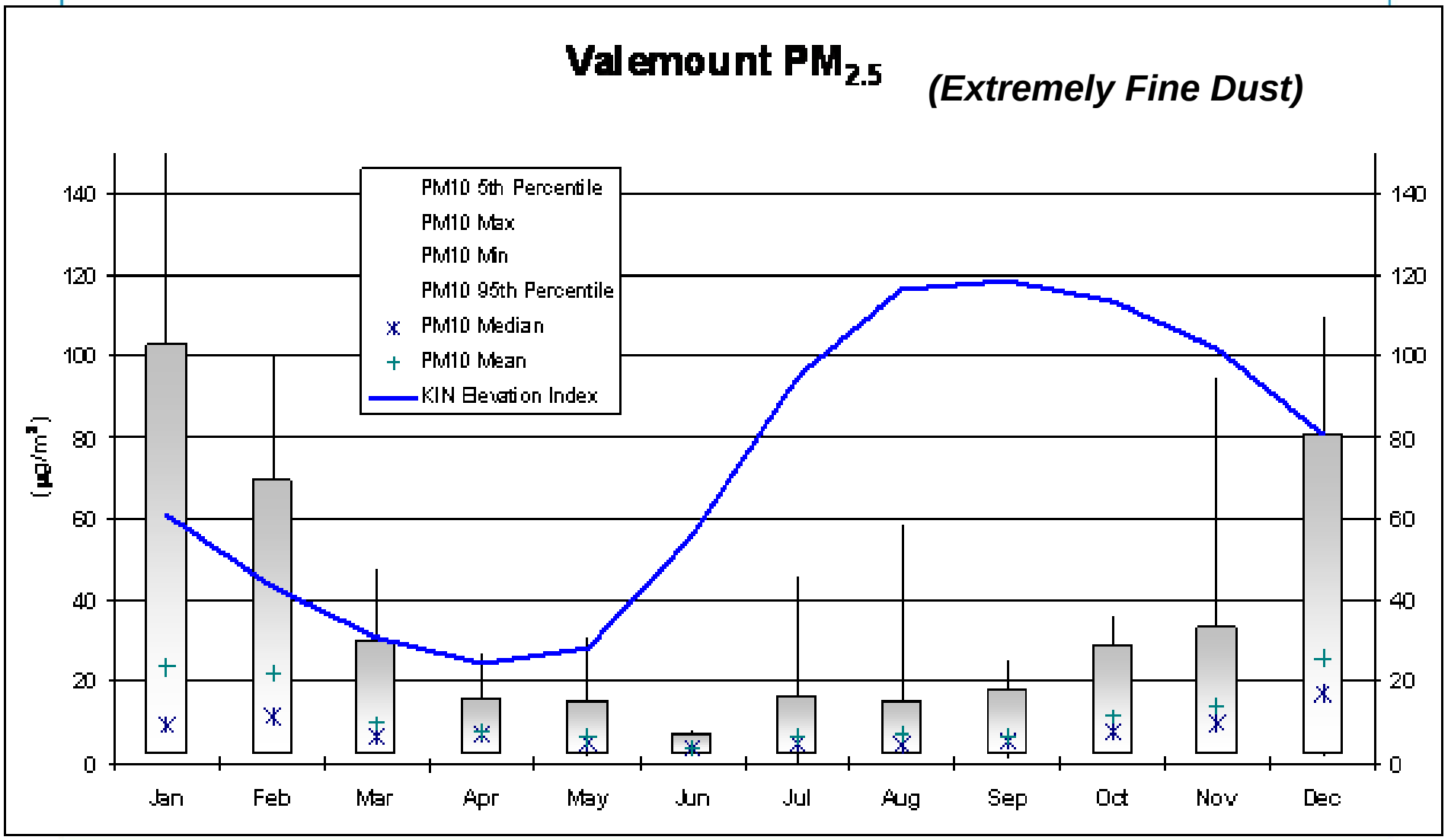
Valemount Dust



Valemount Dust



Valemount Dust

- Monitoring Results:
  - Winter particulate levels exceeds current provincial guidelines for PM10 and PM 2.5
  - Spring/Summer particulate levels do not exceed guidelines
- Monitoring Issue:
  - Discontinuous sampling
  - Photo backup would better define source of events
- BC Hydro examining feasibility of modifying sampling equipment at Valemount, coupled with photographic backup.

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System Flexibility

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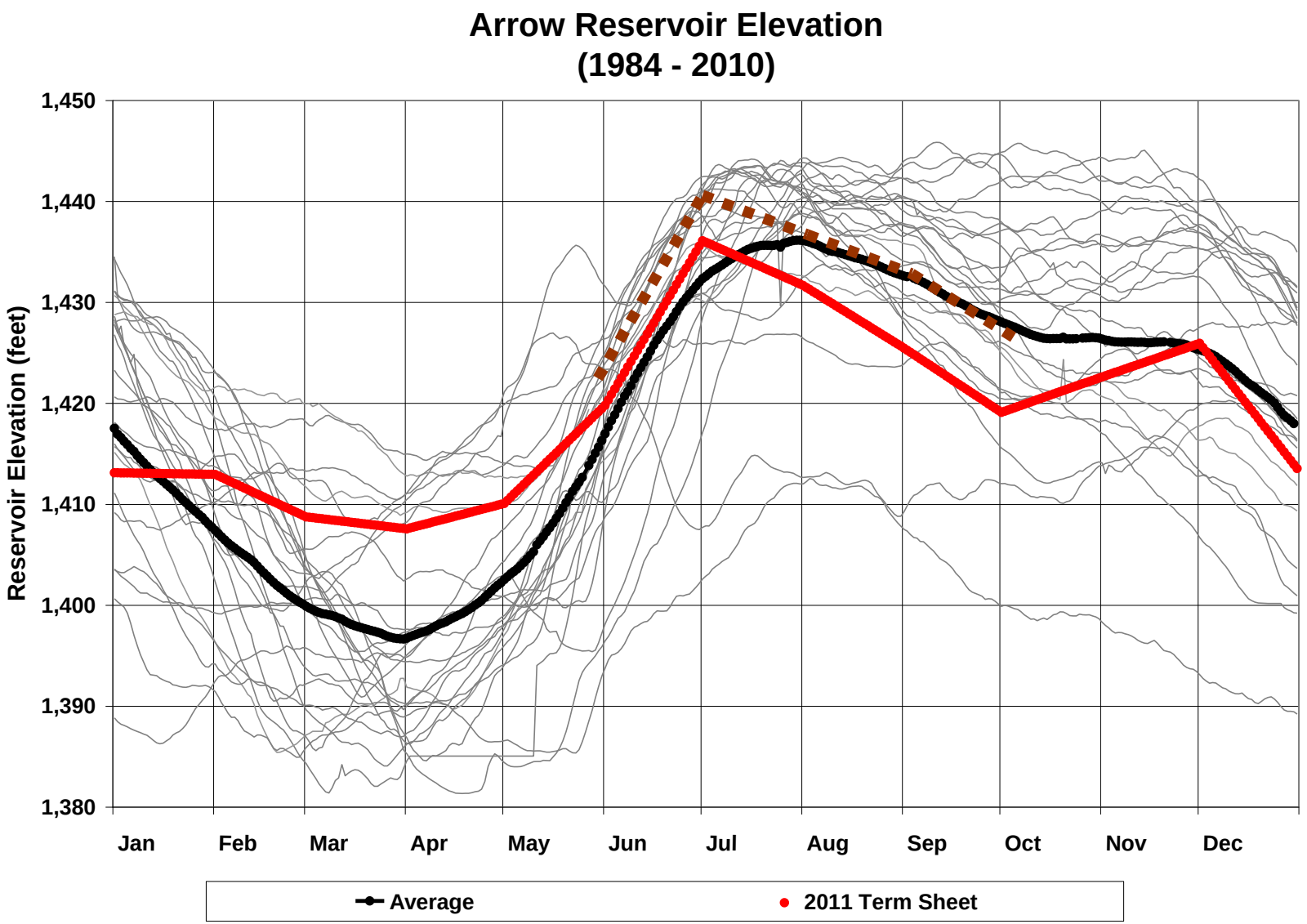
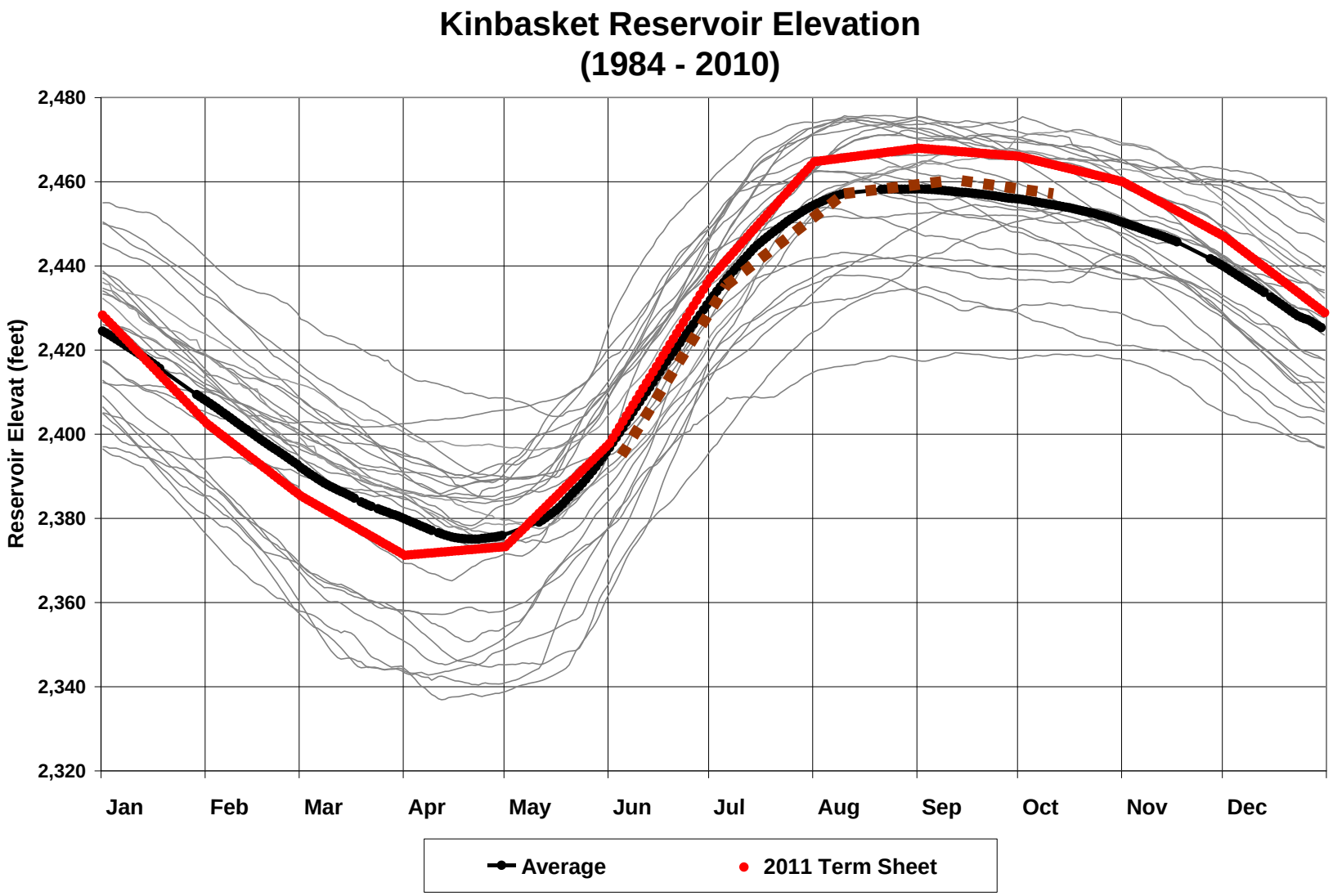
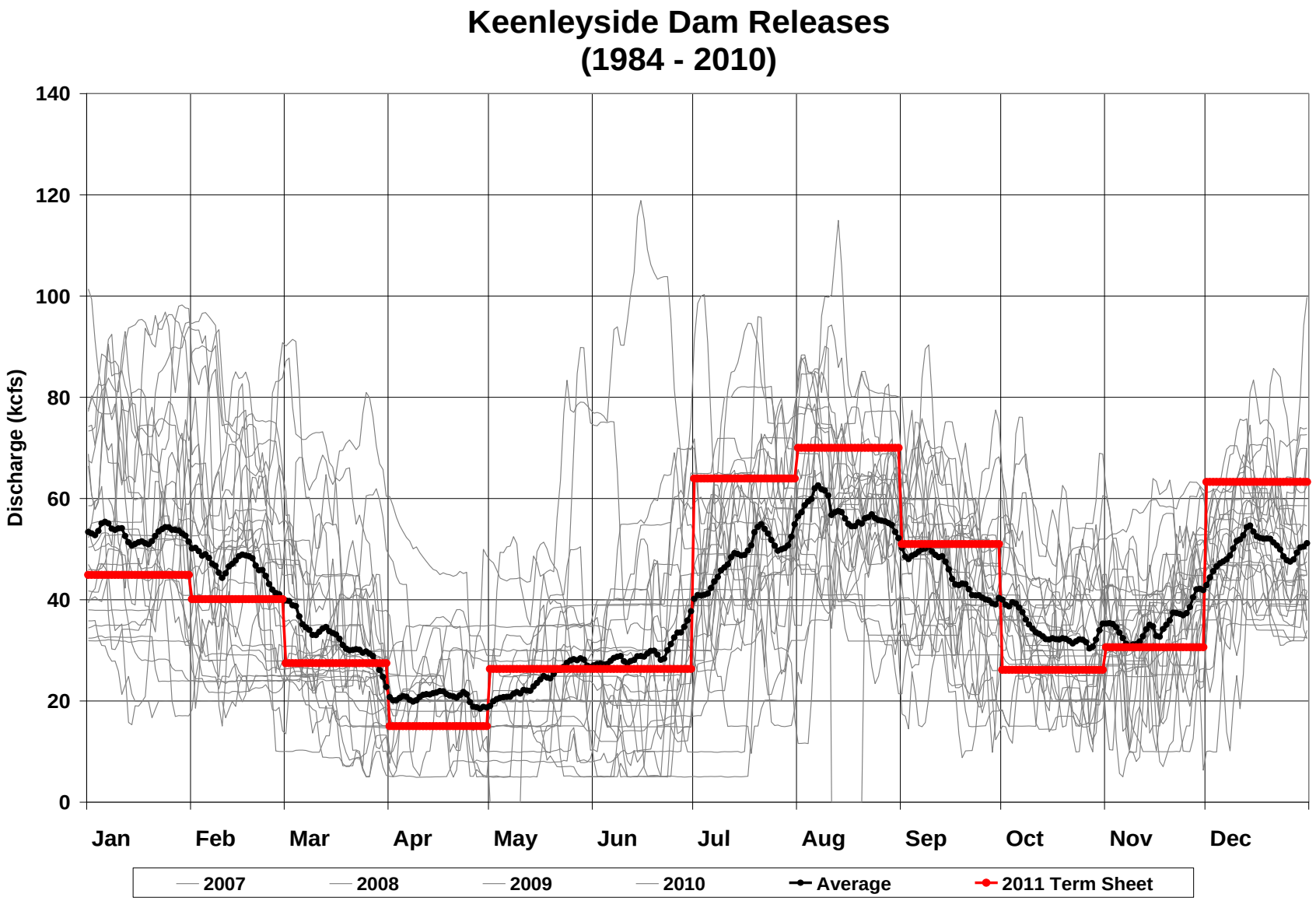
Arrow Reservoir



Kinbasket Reservoir



Downstream Columbia Flows



Performance Measure Reporting

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Performance Measure Reporting

- Current Reporting:
  - WUP Arrow Soft Constraint reported annually
- Expanded Reporting:
  - Potential to include reporting on additional PM's developed through NTSA process.
  - What measures are of particular interest to the forum?
  - Best mechanism to report results?

Overall Outcomes

1. **Achieved BC Hydro Board Objectives:**
   - Optimize power & diverse non-power benefits
   - Improve control of reservoir operations
   - Support of WUP Planning Objectives
2. **Confirmed WLR is working on the things that matter.**
   - Interests expressed are consistent with those raised during the WUP
   - $120M investment is preserved
3. **Identified opportunities for additional information gathering.**
   - Kinbasket heritage studies
   - Improved Valemount dust monitoring.
4. **Gained further insight into stakeholder interests and priorities for ongoing operations.**
   - Opportunity to improve operations reporting across a wider range of performance measures.

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