In-Depth Case Analysis for Columbia River Basin[1]

This case study is one of a series that has been prepared as part of the Global Environment Facility (GEF) International Waters Governance project. The objective of these case studies is to provide insight into how these agreements were negotiated and how well they are working. Each case study has been peer reviewed by one or more experts with direct knowledge of the agreement being analyzed.

1 Overview

1.1 Main Elements of the Agreement

The Columbia River Treaty (CRT) is an agreement between the United States (US) and Canada to develop and operate upstream storage in the Canadian province of British Columbia (BC) in order to provide a regulated flow on the Columbia and Kootenay[2] rivers, and provide flood control and optimise power generation in both countries. It provides for the US to compensate Canada (BC) for the 'downstream benefits' the US could realize (under assumed conditions); and it permitted the US to construct the Libby dam and associated Koocanusa reservoir, which extends into BC.

Canada and the US are the official signatories and Parties to the CRT. However, in two additional agreements, the Federal Government of Canada passed on most of the rights, obligations and benefits to BC. The CRT has no specific termination date. The earliest date of possible termination is 16 September 2024. Either Canada or the US can terminate the CRT at any time thereafter by giving a minimum of 10 years notice. The latest that notification can be given for the earliest possible termination is in September 2014.

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[1] This Case Study was prepared by researchers at the Good Practices and Portfolio Learning in GEF Transboundary Freshwater and Marine Legal and Institutional Frameworks Project at UBC and has been reviewed to date by Tim Newton (Permanent Board of Engineers) and John Shurtz (Pacific Northwest Power and Conservation Council). We thank Glen Hearns, Richard Paisley, Hilary Norris and Moneen Nasmith for their work.

[2] The spelling is Kootenai in the US.

Should the CRT be terminated, Canada may operate the storage projects to maximize energy generation and flood protection in Canada, within certain reasonable constraints based on the flood-control provisions in the Treaty (described below), other governance systems such as the Boundary Waters Treaty, and customary international law. On the other hand, the United States would no longer be obligated to share with Canada the power generation benefits realized in the United States from storage in Canada.

After September 2024, Canada will no longer be responsible for providing 'assured annual flood control', regardless whether the CRT is continued or terminated. However, under certain circumstances, Canada will be responsible for providing 'called upon' flood control (similar to the current 'on call' flood control within the CRT). If the US should request this type of flood protection they would have to compensate Canada (BC) for operating and associated economic[3] losses.

1.2 CRT Focus and Major Provisions

- The focus of the CRT is on flood control and power generation in the Columbia River basin.
- Under the CRT, Canada provided 15.5 million acre-feet (Maf) of reservoir storage at Duncan, Arrow/Keenleyside, and Mica. The combined reservoir storage of all the US and Canadian facilities on the Columbia system is approximately 60 Maf.
- The US paid US$64.4 million to Canada for ½ of the expected avoided flood damages for 60 years (till 2024) under 'assured annual flood control' plans. While the Treaty provides for 15.5 Maf of storage in Canada, Canada is obligated to operate just over half of that storage (8.45 Maf) for assured system flood control.

[3] See Article VI 4. (b)

- The US can request Canada to provide additional 'on call' flood control, subject to proving need and providing additional compensation to Canada. This has never been requested to date (illustrating the effectiveness of the 'assured annual flood control' plans and the difficulty of getting budget approval in the US). For example, 1997 was a year when "on-call" flood control should have issued. However, no call was issued due to inability to obtain funding of the $1.875 million payment to Canada. Fortunately, the runoff was "kind" due to snow-melt conditions, but still produced very high flows.
- The US and Canada share equally in the computed power benefits in the US associated with the regulation of flow from Canada's CRT projects. Increased power benefits are calculated based on 'projected' optimal operation, not actual operation. Therefore, regardless of how the US chooses to operate its dams in real-life; Canada (BC) will receive 50% of the projected agreed amounts of energy and capacity. This is called the Canadian Entitlement.
- Canada's share of the benefits are given to the province of British Columbia as opposed to the federal government (through a side deal between Canada and BC).
- The US paid US$254.4 million for Canada's share of the increased power for 30 years. This money was used to partially finance the construction of the Canadian dams. This sale fully expired on 31 March 2003 such that the Canadian Entitlement has now fully reverted back to Provincial BC government ownership. This is currently about 4000 GWh of power each year, with an estimated annual value of approximately US$300 million.
- The increased power benefits associated with Canadian storage are 'First Added', meaning that the benefit of Canadian storage is recognized in the benefit computations before recognizing storage built in the US after the CRT was signed (including Libby). The 'First Added' status helps to maintain the financial value of Canadian CRT storage. It is questionable if this "First Added" status should

remain based on the evolution of power generation in the region, including wind power.

- The CRT permitted the US to build the Libby dam, which it did in 1973, with the Koocanusa reservoir extending 67km into BC. No direct compensation was given to Canada, but Canada benefits from regulated flow from Libby for its power generating facilities on the lower Kootenay River in BC, and for flood control benefits on the Kootenay and Columbia rivers. Although operations of Libby are not detailed under the CRT (as are the other CRT dams), Canada and the US must coordinate (but not necessarily agree on) its operations. Since 2000, Libby has been operated in coordination with BC power and flood interests through the Libby Coordination Agreement.

Since 1984[4] Canada has the right to divert 1.5 Maf of water annually from the headwaters of Kootenay River directly into the Columbia to provide greater water flows along the Columbia River generating facilities. It has not exercised this right to date. After 2024 this right to divert is limited only by specified minimum flows.

Organisation and management

The CRT is implemented by the Entities, which are BC Hydro in Canada, and (jointly) the Bonneville Power Administration and the US Army Corps of Engineers in the US. In 1998, BC became an Entity for the purposes of receiving the Canadian Entitlement to downstream power benefits when it returned to Canada after the initial 30-year sale to the US.

The Entities develop the Assured Operating Plan (AOP) to focus on flood control and power generation 5 years in advance. The AOP is used to calculate the Canadian Entitlement to power benefits. Actual operations are determined, by mutual agreement, through annual Detailed Operating Plans (DOP), monthly and weekly

[4] See Article XIII 2.

agreements, as well as supplementary agreements that take into account other interests.

The CRT created an independent Permanent Board of Engineers (PEB) to review the implementation of the CRT, provide recommendations to the governments, and assist with resolving any disagreements regarding implementation. Should differences persist, either the US or Canada can refer the issue to the International Joint Commission (IJC), established by the Boundary Waters CRT of 1909, for a decision.

Overall, operations between the official entities have been constructive and collaborative, and the CRT Entities have encountered few serious disagreements.

1.3 Interests outside the scope of the CRT

In developing the CRT, power and flood control were at the forefront of the development priorities. In Canada, there appears to have been relatively little consultation with either First Nations or local communities regarding their concerns. Also, little consideration was given to the effects on other benefits and uses of the river. The situation was similar for the US, in that following the history of dam building on the Columbia River there was a momentum of development for hydropower. However, there was debate within the US as to whether or not solutions should be sought within the US entirely, and not involve Canada. There was a strong argument suggesting that the amount paid for flood control would not be worth the cost at the time. These however remained predominantly at the federal and state government levels. Interest in terms of fisheries or local community interests were not well developed as additional storage in Canada was not viewed to have significant impact in the wake of Grand Coulee and Chief Joseph dams.

The building of Libby dam in Idaho was the only structure to have a significant impact on flow and flooding in the US, and this was not strictly part of the Treaty.

The Treaty simply allowed it to be built as it required consent from Canada to flood part of the Creston Valley. Consequently, as in Canada, Federal and State interests also dominated discourse in the US.

It is worth noting that hydropower was only seen as a medium term solution to energy issues in the region, and that thermal energy plants were intended to take over. This has not occurred and as a result hydropower has a very high value.

2 Geographic Context

2.1 Geography of the Columbia River Basin and Dams

The entire Columbia River basin covers approximately 671,000 km^2. This is roughly twice the size of the Federal Republic of Germany. Approximately 15% of the basin lies in Canada in BC (CRT-Entities, 2007) and can be divided into four principal river systems, the: i) Columbia River, ii) Kootenay River, iii) Pend d'Oreille[5] River System, and iv) Snake River-Clearwater River System.

The CRT regulates the mainstem Columbia and Kootenay systems, specifying operations of the Arrow, the Duncan, and Mica dams (Figure 1). Other transboundary rivers such as the North Fork Flathead River (part of the Pend d'Oreille system) and the Okanogan[6] River fall under other governance regimes such as the Boundary Water CRT of 1909 (when applicable), or customary international law. The longest tributary to the Columbia, although not the largest in water volume, is the Snake River located entirely within the US.

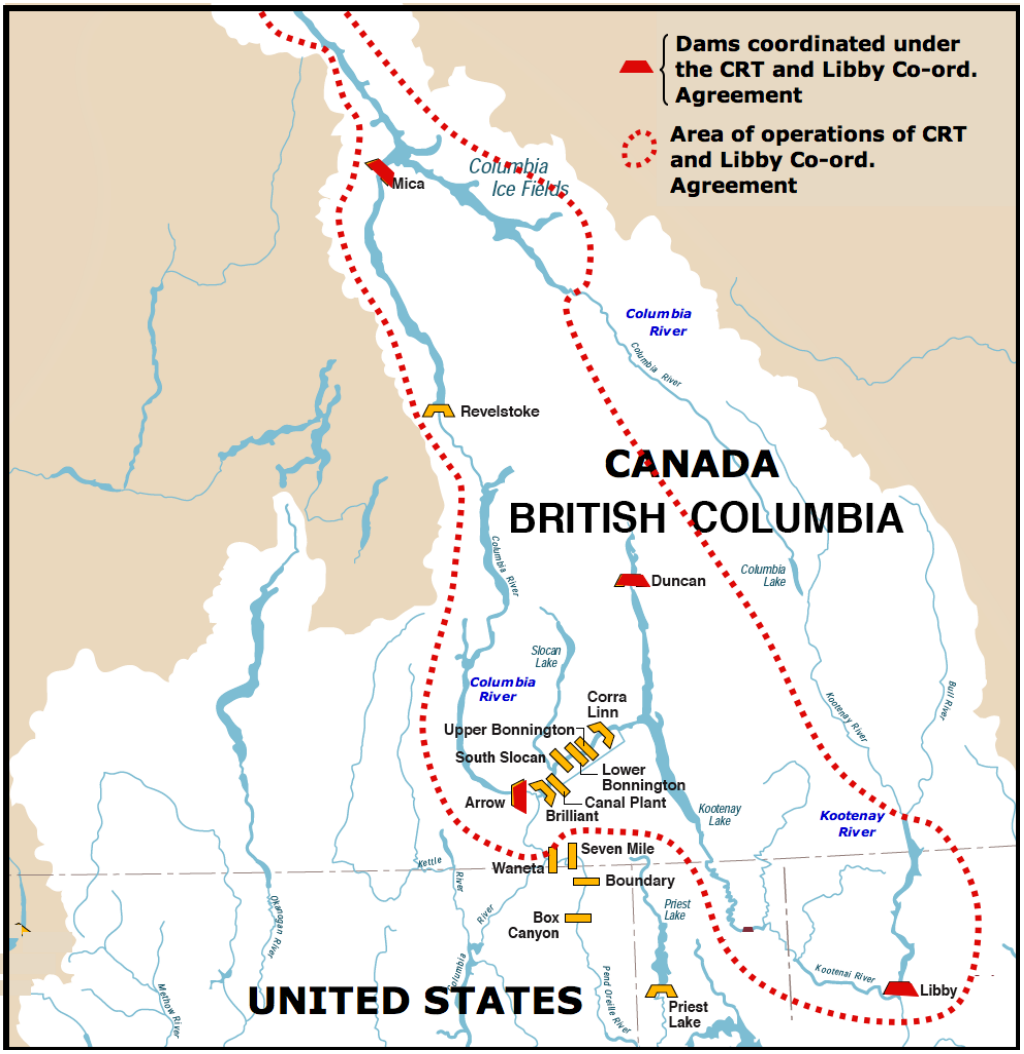
The Columbia River is approximately 2000 km long and has an impressive elevation drop of 2690 feet (820m) from its headwaters in Columbia Lake (CRT-Entities, 2007). In general, the rivers flow from BC into the US. However, the Kootenay River flows south from BC into the US and then north returning to BC, where it joins the

[5] US spelling is Pend Oreille.
[6] The Spelling in Canada is Okanogan

main stem of the Columbia River (Figure 4.1). While the main stem of the Columbia and Kootenay river systems in British Columbia are less than 15% of the entire Columbia basin, they supply approximately 35% of the water flowing through the river at Portland, and as much as 50% at flood levels (BPA, 2008). The Canadian portion of the basin directly feeds into Lake Roosevelt, the reservoir behind Grand Coulee Dam, thus greatly influencing power production at Grand Coulee, the biggest power producer on the river.

The upper Columbia and Kootenay systems experience great variability in seasonal flows with high season flow (in June), as much as 40 times greater than low season flow (in January). Furthermore, the inter-annual flow volumes vary as much as 4 times (CRTHMC, 2001).

Figure 1 Dams affecting flow on the Upper Columbia and Kootenay Systems (Hearns, 2008)



3 Treaty Context

The CRT can be viewed as a subsidiary agreement between Canada and the United States on transboundary water issues. Canada and the USA have a prior agreement known as the Boundary Waters Treaty. The Treaty Between the United States and Great Britain Relating to Boundary Waters and Questions Arising Between the United States and Canada (BWT) was signed in January, 1909 between the US and

Great Britain to oversee issues related to waters on the boundaries between the US and Canada. The BWT has no termination date. However, either the US or Canada may terminate it with 12 months notice.

The BWT established the International Joint Commission (IJC) to approve of any issues affecting the natural flow of boundary waters between the US and Canada. For example, in 1988 the IJC recommended that an open pit coal mine in the Flathead River in BC should not be constructed until its potential risks are deemed acceptable to both countries.

In the BWT, boundary waters are narrowly defined as lakes, rivers and waterways along which the international boundary passes (BWT- Preliminary Article). It therefore generally deals with lakes or reservoirs which may have trans-boundary influence. Consequently, while Canada had wanted it to include trans-boundary rivers, they are not under the overt jurisdiction of the IJC (LeMarquand, 1993) unless they form part of the border. However, Article IV of the BWT also gives the IJC authority over obstructions, such as dams, on trans-boundary rivers where the reservoir extends upstream across the border. Pollution of "waters flowing across the border" (trans-boundary rivers) is also under the rubric of the IJC (BWT- Article IV), and considered as one of its vital roles (Parresh, 2005).

While the BWT should extend to the Koocanusa reservoir, Article XVII of the CRT explicitly states that the BWT does not apply to the projects permitted by the CRT (Libby Dam and its Koocanusa reservoir) that back water across the border). However, in terms of the cross-boundary movement of water pollution the IJC would still have jurisdiction. Moreover, the BWT and IJC jurisdiction still apply to any Columbia basin structures that back water up-stream across the border, old or new, with the exception of CRT projects (Bankes, 1996). These infrastructure projects would have to be approved by the IJC. For example, The IJC has written Orders of Approval for

- Grand Coulee Dam and Lake Roosevelt on the Columbia.

- Corra Linn Dam and Kootenay Lake.
- Zosel Dam and Osoyoos Lake.

Of great importance, however, is the provision under the BWT for both governments to refer issues, such as the 1988 Flathead coal mine, to the IJC for report or decision, although a reference for decision has never been used. This is particularly important in the Columbia as both Canada and the US asked the IJC to report on cooperative uses of the Columbia River, leading to the CRT.

Also, the IJC is the first resort for arbitration for any differences of the Parties arising under the CRT (Article XVI). (See section on dispute resolution below)

4 Background to CRT Development and Negotiation

The CRT was developed in the wake of large hydro-development of the Columbia River in the US and was seen as a way of gaining added benefit to existing structures (Krutilla, 1967). Canada[7] and the US signed the BWT of 1909 establishing the International Joint Commission (IJC) to approve of obstructions or diversions that alter the natural level or flow of boundary waters.[8] Although the Columbia River is considered a 'transboundary river' and not a 'boundary water,'[9] in 1944, the governments of Canada and the US requested the IJC to investigate and recommend a plan of development for the upper Columbia Basin (McNaughton, 1958). At the time, the US produced 40.3 billion kWh per year on the Columbia, compared to Canada's 2.7 billion kWh (ICREB, 1959). The IJC created the International Columbia River Engineering Board (ICREB) to analyze use of Columbia waters with respect to:

- domestic water supply;

[7] It was actually Great Britain that signed the BWT on behalf of Canada.
[8] Article III of the *Treaty Between the United States and Great Britain Relating to Boundary Waters and Questions arising Between the United States and Canada, Washington, 11 January, 1909.*
[9] 'Transboundary river' is considered as water that flows across the border; 'boundary water' is water where a boundary crosses, i.e. Lake Ontario. See Glossary (Section 7).

- navigation;
- efficient power;
- flood control;
- reclamation;
- conservation of fish and wildlife; and
- other benefits (ICREB, 1959).

The IJC technical studies took 15 years to complete and examined a variety of alternatives. It recommended up-river storage in Canada on the Columbia and its tributaries as the most effective for meeting the countries' economic and flood control benefits (IJC, 1959). During that time, at least another six technical studies were undertaken by the US, BC and Canada, including a study which assessed diverting the Columbia River into the Fraser River and developing the latter for hydropower (McNaughton, 1958).

While several different options for achieving the desired storage were debated, storage at the Arrow Lakes was generally common among them. The proximity to the Roosevelt reservoir behind the Grand Coulee dam, and the large portion of Canadian flow generated in the area meant that storage at Arrow was of great importance for developing firm (or guaranteed) power at Grand Coulee and controlling flood flows. The principle debate amongst the decision makers was whether to build a high or low dam at Arrow (McDonald, 1993; McNaughton, 1958). Agreement was achieved on the former option and was subsequently written into the CRT.

While the studies were still being conducted, a large flood occurred in 1948, causing great damage in both the US and BC, wiping out Vanport, the second largest city in Oregon at the time, among other effects. The flood displaced 30,000 people and killed 50, highlighting the need for collaborative action (BPA, 2008). The event

served to emphasise the importance of the proposed CRT facilities and ensured political commitment to the process (Le Marquand, 1977; McDonald, 1993; Wilson, 1973).

Acting as a neutral third party, the IJC further determined 16 principles to assist CRT negotiations with respect to selection of the project sites, and the calculation and apportionment of benefits of power development and flood control (IJC, 1959). These 16 principles later formed the core of the final agreement, particularly with respect to equitable sharing of downstream benefits and how those should be considered.

The role of the IJC should not be underestimated. The engineering concepts and ultimate recommendations of the IJC were crucial (Swainson, 1979; Bankes, 1996) and 'a contribution of substance'. They were also well articulated and advanced the understanding of economic equity considerations (Krutilla, 1967). The importance and role of third parties, such as the IJC, as fact finder and technical mediator should not be underestimated and may be the most important role for such types of commissions (Le Marquand, 1993; Lepawsky, 1963).

It is also noteworthy that during the negotiation of the CRT, other efforts were taking place between Canada and the US with respect to joint water resources. The IJC was extremely active in the 1940s and 1950s establishing several international boards, as well as issuing the Kootenay Lake Order (1938) and creating the Niagara River Diversion Treaty (1950), amongst others.

5 Costs and benefits

The Preamble to the CRT indicates that it was developed to operate the water resources of the Columbia Basin "in a manner that will make the largest contribution to the economic progress of both countries." After allowing for consumptive uses, including irrigation, the CRT focused on flood control and power generation, as officials at the time felt that cooperation in these areas would

generate the “greatest benefit to each country”. However, what constitutes the greatest benefit depends upon ones perspective.

As laid out in Table 1, there are different costs and benefits associated with the implementation of the CRT. There continue to be supports and critics of the agreement. Many feel that both countries have benefited from the CRT over the last 45 years, although to varying degrees. Supporters of the treaty argue that at the time the Treaty provided the most equitable sharing of benefits possible and that the Treaty makers could not have foreseen the future, but did their best to a make a stable and adaptable agreement. Some indicate that in the earlier half of the Treaty the US benefits disproportionately; while currently, in the latter half, Canada is benefiting disproportionately. Some suggest that the one time payment for flood control was too little, while others suggest that the payments for power benefits are not worth the gained power production. On the whole, however, there is general agreement among scholars that both countries have benefited from the Treaty.

At the same time, there is continued concern over the lack of public participation, particularly local communities, in decision making surrounding the implementation; as well as growing concern for environmental factors; and lack of ability to dealing with modern power generation in the region, such as wind power.

One example of flood control benfits occurred in 1997, when there was a threat of serious flooding, the CRT storage on the Columbia prevented an estimated $1 billion worth of damage that might have occurred in Portland alone (BCH, 2008), as well as providing flood control in Canada. In 2002, which was an average water year, peak water levels in Trail, Canada, would have been 2.38 m (7.8 ft) above the flood level (PEB, 2002) were it not for CRT flood control storage.

Both Canada and the US clearly benefit from flood control provided by Canadian facilities pursuant to the CRT. Under the CRT, Canada received a ‘one time’ payment of US$64.4 million in exchange for the annual operation of 8.45 Maf of storage for flood control until 2024 (Article VI (1)). For each “on call” request, Canada also

receives electrical power equal to the hydropower lost for providing the flood storage, as well as $1.875 million for the first 4 'on call' flood requests (Article VI (3)).[10] The power is to be delivered at the same time as the power is lost, so it is both equal in amount and equivalent in value (Article VI (3)).

The dams built in the Canadian portion of the river have augmented generation of hydro electricity in two ways. Firstly, the assured flow allowed additional power generation to be installed at Grand Coulee, Bonneville and Chief Joseph dams, which otherwise would have been economically unfeasible at the time. It also allowed the creation of new power generating facilities in Canada. The Columbia system in Canada generates approximately 25,000 Kwh/year, nearly half of the electrical energy produced in British Columbia.

Secondly, the regulated flow increased the efficiency of existing power generation in the US by approximately 8000 GWh[11] per annum (CRT-Entities, 2008). This is estimated at a value of over $600 million per year, which may be either in actual power or in sales to other utilities. Canada and the US share equally in this 'additional power generated through efficiencies in the system'.

Table 1: Costs and Benefits of the CRT

Benefits	Costs
• Flood control. • New Power generation. • Increased efficiency in existing/pre CRT power generation. • Sharing of downstream benefits between countries. • Increased integration and coordination of water	• Increased negative impact to fish, including salmon.[1] • Negative impacts to wildlife and the loss of important wetlands • Displacement of people. • Flooding of productive valley floor and wetlands. • Increased sense of marginalisation of local

[10] This has never been used.
[11] This is the equivalent of approximately 1.2 million homes based on "Electrical Energy." The New Book of Popular Science. 2000 edition.

management.	communities • Increased sense of marginalisation of Indigenous people

The costs associated with the CRT largely involve social and environmental losses. The inundation created by the dams[12] flooded an estimated 40,000 ha of Lake systems, 8500 ha of rivers, 12,000 ha of wetlands and 20,000 ha of floodplains.[13]

The inundation of the rivers and lakes systems has had a large impact on local fish and wildlife populations. While larger reservoirs created potentially more habitat for lake species, the varied reservoir levels result in relatively diminished littoral productivity.

The Columbia was one of the most, perhaps the most, productive salmon bearing rivers on the west coast. Currently, there is no significant natural production, and an elaborate system of transporting fish around some of the major facilities is used to maintain the natural fish that are left. However, the migration of Pacific salmon into the upper Columbia basin was initially affected by the Bonneville and Rock Island dams in the 1930s in the lower portion of the river in the US. Salmon passage into Canada was effectively stopped by the building of the Grand Coulee (1948) and Chief Joseph (1955) dams. [14]

The Canadian dams, however, did have their impact, both on the local environment and through out the basin. The dams not only flooded large areas in Canada and altered local flow patterns, but they also changed sediment patterns and nutrient balances in both the upper and lower portions of the basin.

[12] Only considering CRT dams: Hugh Keeleyside, Duncan, Mica and Libby.
[13] Draft Report of Dam Footprint Impact Summary, Golder Associates and Kutenai Nature Investigations, December 2009.
[14] All these dams were built unilaterally in the US without consultation with Canada, yet they affected Canadian fisheries and livelihoods (not only in the Columbia watershed, but also fishermen on the coast which depended on Columbia salmon fish.

In terms of stakeholder and local interests, there was relatively little input from local communities and indigenous groups that were to be affected by the development of the dams. Many of these communities have felt marginalised and there continues to be a strong call for greater participation in the management of the river by local communities. There is more on this issue under the section entitled stakeholders.

6 Observations

There have been significant benefits from the development of the Canadian portion of the Columbia River under the CRT. This is particularly true when considering the incremental costs associated with building the dams in the wake of extensive development on the system in the US prior to the CRT. Nevertheless, the social and environmental costs were not adequately considered at the time of development of the CRT.

Scholars and academics do not agree whether the CRT meets the needs of the countries and was a 'good deal' (Krutilla, 1967; Sewell, 1964; Sewell and Utton, 1986; Le Marquand, 1977). Under the final agreement, Canada was compensated for providing flood control and received an equal share of the power benefits from increased generation capacity in the US. British Columbia was strapped for funds to construct CRT dams, but this was addressed when the US agreed to purchase the first 30 years of Canadian Entitlement to downstream power benefits (DFAIT, 1964; Sewell, 1964). The US also wanted to use the Kootenay River for power development and irrigation, and, under the CRT, Canada gave the US five years to exercise an option to build the Libby dam and Kocanusa reservoi. Canada received no direct compensation for the relocation of roads, rail, and other structures that were affected, the value of which was estimated at $US 8.5 million in 1961 (Article XII (4) of the CRT; US Senate, 1961). However, significant flood control and power benefits pursuant to the CRT were realized along the lower Kootenay in Canada.

Canada received no compensation for the loss of one of its most promising agricultural lands in the Arrow Valley. In the late 1950s the valley was assessed as one of BC's 3 most important agricultural areas (McDonald, 1993). Krutilla (1967) suggests that the agreement was not good in terms of laying out the economic benefits. His understanding at the time was that the US had overvalued the Canadian addition of storage capacity, and that additional storage in the US could have been considered first, with therefore less need on Canadian storage. Others suggest that a high degree of balancing incentives and meetings each others needs is well laid out in the final agreement (Sewell, 1964; Sewell and Utton, 1986), for instance, British Columbia securing the sale of electricity to the US.

Although the agreement laid out a fair arrangement for planning, operating facilities and calculating shared benefits, there is debate as to whether the benefits really have been shared equitably. Due the increase in environmental legislation in the US an increasing amount of flow which otherwise would have gone to optimising power generation is being released for fisheries concerns. The result is that while Canada continues to receive its calculated 50% share of benefits, the US receiving less than its calculated 50% share. The flows being given for fisheries come out of the US portion of the benefits. The reason being is that the Treaty does not specifically allow for such alterations that do not mutually benefit both parties. While there are likely relationships between different populations of sturgeon and whitefish in different parts of the Columbia, it is debateable how much benefit Canada receives from enhanced fish flows in the US.

7 Flexibility of the Agreement

7.1 CRT Provisions

The CRT itself can be, and has been, modified by mutual consent through the development of protocols.

The CRT allows for flexibility to operate individual dams for maximum Canadian benefits, provided storage operations remain within the constraints of the CRT[15] and water flow across the Canada / U.S. border remains unchanged. This flexibility allows BC Hydro to move water between Mica, Revelstoke,[16] Arrow/Keenleyside and even Duncan in response to various power, social and environmental interests.

Decisions entirely internal to Canada to deviate from CRT Storage Regulations may be made with respect to flows below Mica, providing discharges from Arrow are not affected and flood control is protected. For instance, negotiations may occur to improve survivability of Kokanee Red fish in certain stretches along the river above Arrow/Keenleyside.

Dam operations may also be altered by mutual consent of the entities. The Detailed Operating Plan (DOP) is developed annually and spells out the operating rules that define how water will be drawn from dams and systems throughout the year. It is based on the Assured Operating Plan (AOP), but may deviate from it by mutual agreement, and for mutual benefit, either at the stage of developing the DOP, the TSR or at the weekly level through the weekly agreement.

For example, it is not uncommon that small alterations to releases will be requested based on unforeseen circumstances throughout the week. Flood control requests can be on a daily basis, while requests dealing with power are typically done at the weekly conference call and weekly agreement.

The recurring need for alterations in operations, particularly for benefits to fish, has resulted in numerous supplementary agreements. For example, the countries have agreed to a series of agreements on the release of water for fish under the Whitefish Agreements. These agreements are annual and generally reinstated each year such

[15] A Flood Control Operating Plan is drawn up each year.
[16] Revelstoke is not a CRT dam.

that storage can be used in Canada to benefit whitefish and trout and later releases to benefit juvenile salmon and steelhead in the US.

While there are numerous supplementary agreements regarding non-power and flood control benefits the Parties have yet to consider money as a means of benefit exchange under the DOP to accommodate the interests of fisheries or other values.

The major constraints to the CRT are generally those associated with the Flood Control Operating Plan, which sets dam specific maximum storage levels in the Canadian dams. As such it can be a significant restriction on operation in the flood season and can be seen as 'hard' constraint to operations. Furthermore, available storage is devoted to power optimisation and thus reservoirs are often below what would be mandated for flood control alone. Power optimisation is a desired outcome under the Treaty and thus further constrains flexibility in operations. Power generation, however, can be seen as a goal rather than an absolute, and is thus a 'softer' constraint than flood control. An example of this the US not optimising power generation in lieu of fisheries benefits.

7.2 Observations

The CRT has a relatively high degree of flexibility built into both the ability to alter the CRT, without terminating the CRT, as well as within the operational aspects of managing the river. While flows and operations are constrained by assured flood control, there is ability to alter the yearly, monthly and even weekly flows as deemed necessary.

While the Assured Operating Plan is very prescriptive, modifications can be made to the Detailed Operating Plan through mutual consent. Moreover, flexibility is developed through supplementary agreements, such as the Whitefish Agreements. Also there appears to be nothing restricting financial payment as a mechanism to achieve mutual benefit.

The supplementary agreements help to project dam operations more in line with current fish and environmental concerns and the evolving modern power system. Whether the degree of flexibility within the CRT will be able to accommodate alterations due to climate change combined with future shifts in social values remains to be seen. Certainly in terms of providing for flood control the CRT will likely be able to be flexible. However, if there is decreased water precipitation in the summer and less storage in the winter in terms of snow melt (resulting in a greater reliance on dam storage, it is not clear whether the CRT will accommodate emerging environmental interests also?

8 Data and Information Exchange

Information sharing within the context of the CRT is one of the key elements of CRT success. During the negotiation of the CRT there was continual information exchange through the International Joint Commission which acted as a neutral third party and undertook engineering studies on behalf of both parties.

The CRT itself is very specific in terms of information exchange (Article 14) and obligates the 'entities' to 'coordinate plans and exchange information relating to facilities' as well as establish and maintain a hydrometerological system.[17] Moreover the entities are to work together to develop the flood control operating plan as well as detailed operation plans on an annual basis.

The entities work closely in monitoring and evaluating the system for continual updating and decision-making. This is highlighted by a weekly flow agreement detailing the exact flows to be released during the following seven days. Flow alterations within the week can be accommodated, however these are generally rare as they deal with unplanned events.

[17] Annex A is dedicated to describing the hydrometeorological system and information gathering.

8.1 Observations

In general information exchange has been well conducted and is important for developing a reasonable and informed basis for furthering the work of the IJC (Swainson, 1979; Bankes, 1996; Krutilla, 1967; Mandal, 1992; Le Marquand, 1993). In particular, important information was exchanged regarding social and economic projections between 1961, when the CRT was first signed by the US, and 1964 when protocols were added and the CRT signed by Canada in which it secured the sale of excess energy to the US. This was despite the fact that in 1963 Canada's energy policy forbade the export of energy (Krutilla, 1967).

Information exchange in the continual management and operations of the CRT is also highly developed and key to the CRT's continuity, effectiveness and flexibility, as well as avoiding conflicts at the formal level.

9 Dispute Resolution

9.1 The Settlement of Differences

Settlement of differences is dealt with by article XVI of the CRT. It identifies the International Joint Commission as the primary mechanism for resolving disputes which Canada and the US cannot resolve. If the Commission is unable to render a decision within three months either country may submit the difference to arbitration. Arbitration is to be conducted by a tribunal composed of a member appointed by each of the parties (Canada and the US) and a member who should be appointed jointly to chair the process.

The parties are to accept as definitive and binding any decision of the International Joint Commission or the tribunal.

9.2 Observation

To date no dispute related to the implementation of the CRT has ever had to be decided by either the Commission or a tribunal. In practice differences are generally dealt with and resolved between the entities responsible for implementing the agreement. Also, they may be informally resolved by the Permanent Board of Engineers, which is a body created to ensure that the entities are implementing the CRT according to its provisions.

One of the major controversies with respect to CRT interpretation lies in Article XII (1), which deals with the construction and operation of the Libby Dam. Under the CRT the US had the option to built Libby "to provide storage to meet flood control and other purposes in the US".

Based on the focus of the CRT, and the fact that all benefits which occur in either country due to the operation of Libby remain in that country (Article XII (2)), Canada interprets 'other purposes' to principally mean 'power generation'. The US interprets 'other purposes' to also include fisheries issues. Consequently, the major concern with the CRT is the unilateral U.S. operation of Libby (to address environmental concerns) which negatively affects power generation in Canada. The Libby Coordination Agreement (2000) has effectively resolved this by allowing Canadian power producers to compensate themselves for lost power due to operations of Libby for fisheries benefits.

Dialogue and close operational and management ties between the entities means that each party's interests are usually taken into consideration at an informal level without generally elevating to a formal level.

Nevertheless, should a formal level be needed for this or any other aspect of the CRT, there is a set mechanism for how to proceed. In some respects the potential of utilising an effective resolution mechanism helps to resolve most issues quickly at an informal and operational level.

10 Participation and Role of Multiple Stakeholders

10.1 Stakeholder Participation

The agreement itself makes no mention of community engagement or the need for public participation.

Although numerous engineering studies were conducted regarding technical aspects of the proposed water storage system, relatively very little analysis was undertaken on the potential social, economic and environmental impacts that the CRT dams would have. This is particularly true in Canada where the impacts were obviously be greatest, but also at the local level in the US in determining what power and flood control benefits could be gained. Furthermore, little effective consultation was conducted in Canada with those most affected by the projects. Both the Federal and BC governments appeared to distance themselves from any dialogue or debate around impacts to local interests. While local concerns were raised regarding fisheries, livelihoods as well as flooding, these and other issues were not in the forefront of Provincial and Federal interests at the time (McDonald, 1993; Wilson, 1973).

10.2 Current stakeholder involvement

In 1995, the Columbia Basin Trust (CBT) was created by the Columbia Basin Trust Act to benefit the region most adversely affected by the CRT. The CBT received a $295 million endowment to construct power facilities and for reinvestment into the area.[18] Income from power investments is being spent on social, economic and environmental benefits for the residents of the Basin.

In the United States the public has been increasingly involved in the conservation and management of the Columbia including through the Northwest Power Act and

[18] Taken from www.cbt.org

the Northwest Power and Conservation Council, the federal Endangered Species Act involving federal, state and tribal resource agencies, and through the US court system.

To accommodate interests other than flood control and power generation, the entities have the ability to use flexibility within the CRT, as well as mutual agreements with the US to manage for additional Canadian interests (See section 4). In Canada, to help mitigate some of the effects of the Canadian facilities, BC Hydro, the BC Ministry of Environment and Fisheries and Oceans Canada have created the Columbia Basin Fish and Wildlife Program for conservation and enhancement of species.[19]

10.3 Observations

Stakeholders and public participation in the workings of the CRT are not well established and remain one of the key areas of contention with respect to the CRT. Effort is made to address social and environmental issues, but not necessarily in a formal way with respect to either CRT development or implementation. Rather, stakeholder involvement is focussed on operations of the individual dams themselves.

In Canada this is conducted through detailed Water Use Plans developed for each facility. However, there has been criticism that the planning process is limited in scope as it is constrained by international obligations of the CRT.

In the USA, the Northwest Power and Conservation Council was created by Congress through the 1980 Pacific Northwest Electric Power Planning and Conservation Act to give the citizens of Idaho, Montana, Oregon and Washington a stronger voice in determining the future of key resources common to all four states — namely, the

[19] See www.fwcp.ca

electricity generated at, and fish and wildlife affected by, the Columbia River Basin hydropower dams. The principal duties of the Council are to:

- Develop a regional power plan to assure the Northwest an adequate, efficient, economical and reliable power supply.
- Develop a fish and wildlife program as part of the power plan to protect, mitigate and enhance fish and wildlife affected by hydroelectric development in the Columbia River Basin, and make annual funding recommendations to the Bonneville Power Administration for projects to implement the program.
- Provide for broad public participation in these processes and inform the public about regional issues.[20]

11 Sustainable Financing for the Agreement

11.1 Costs for Maintaining Management

The entities under the agreement are responsible for providing funding for their participation. In the case of BC Hydro in Canada, it is a crown corporation, and thus owned by the province of British Columbia (not the federal government of Canada).

In the US, both the Bonneville Power Administration and the Army Corps of Engineers are Federal based agencies and are funded from the government of the US to implement the CRT.

11.2 Major Capital Costs Financing

Any new costs such as maintenance or upgrades are born by the entities, in effect the provincial government of British Columbia in Canada, and the Federal government in the US.

[20] http://www.nwcouncil.org/library/2004/2004-16/public.htm (last visited 30 September 2010)

The province of British Columbia negotiated with the US the sale of the 'Canadian portion of the downstream benefits' of power generation for the first 30 years for US$254 million. The money helped pay for the construction of the three CRT dams in Canada.

11.3 Observations

US assistance in financing the three CRT dams in Canada through the sale of the Canadian portion of the downstream benefits for 30 years and the sale of flood control was important. Also, British Columbia took advantage of the opportunity to build the Kootenay Canal project on the Kootenay River as well as another large dam on the Columbia at Revelstoke to increase the output of Canadian power.

The day to day operations and implementation of the CRT is paid for by the entities which derive money from the generation of additional power. The money gained by the additional power generated in the US associated with the CRT far out weighs the cost of implementing the agreement on an annual basis.

12 Implementation

12.1 Relationships between the Parties

The governments of Canada and United States are the primary parties to the CRT, but subsequent agreements bring others into the fold.

Under Article 14, the CRT created Entities to enact the provisions of the agreement. The CRT Entities are BC Hydro and Power Authority for Canada; and Bonneville Power Administration and the Army Corps of Engineers for the United States.[21] In

[21] Note however, that the 'Entities' are persons in the US, namely the Administrator of Bonneville Power Administration and the North Pacific Division Engineer of the Army Corps of Engineers. When those officials and their employees are acting in their Treaty Entity capacity, they think of themselves as acting independently from the federal agencies themselves. Clearly, it is debateable how

1998, when the Canadian Entitlement to downstream power benefits began to be returned to Canada, the Province of BC also became an entity for the sole purposes of receiving the money associated with the Canadian share of benefits within the U.S. (i.e. selling the electricity directly in the U.S. without first bringing it back to Canada). BC does not involve itself in the running or operations of the dams or implementation of the Treaty.

To assist implementation of the CRT, the Entities created an Operating Committee (CRTOC) and a Hydro-metrological Committee (CRTHMC) (Article XIV). The CRTOC plans, implements and assesses the actual operations at the facilities, as well as the development of the AOP studies. The CRTHMC is responsible for planning and operating the hydromet of data gathering systems and for providing water supply forecasts., and other essential information.

Article 15 established the Permanent Engineering Board (PEB) to provide an independent review of CRT implementation. It collects statistics, ensures that the objectives of the CRT are met, and reports to the Canadian and U.S. federal governments. It consists of two persons from Canada (one Federal and one Provincial) and two from the US.

The PEB is not an arbitration board but can 'fact find' with operations, meaning that they can determine a view on how operations are being conducted. That 'fact' will be accepted in any further tribunal deliberations or rulings.[22] This threat of finding facts that shall be used in subsequent arbitration has given the PEB considerable influence in settling disputes. Moreover, the PEB can assist with resolving any contentious issues through dialogue and facilitation.

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independent they can be if their salary comes from federal agencies, nevertheless, the intent of independence is there.

[22] Article XV 3. in part "shall be prima facie evidence of the facts unless rebutted".

Annually the PEB reports out to each of the parties (Canada and United States). Strictly speaking the PEB does not decide or make rules, but its recommendations are powerful and are generally respected by the governments.

The PEB created the PEB Engineering Committee to assess technical elements of the CRT operations.

12.2 Observations.

The management of the CRT is both efficient and effective. It has also helped develop a much greater sense of shared responsibility and joint decision making over shared resource. Management may be particularly effective as it has been implemented by government agencies specifically set up for the purpose of water management, flood control and power generation as opposed to government ministries which may include these issues as part of a larger mandate.

13 Overall conclusions

Based on the high level of cooperation and coordination in implementing the agreement, it can generally be seen as a very successful accord (Muckleston, 2003; Hearns, 2008). There has never been a need to utilise the dispute resolution mechanism incorporated into the agreement because the PEB has provided successful oversight of CRT implementation (PEB, 2002), and most of the issues arising over the management of the waters are addressed at the operational level. Furthermore, the organisations involved were able to accommodate a variety of interests not anticipated under the original CRT, resulting in a number of subsidiary agreements such as:

- Agreement between Bonneville Power Administration and British Columbia Hydro and Power Authority relating to (1) Use of the Columbia River Non-CRT Storage, (2) Mica and Arrow Reservoir Refill Enhancement, and (3) Initial Filling of Non-CRT Reservoirs. (July 1990).

- Pacific Northwest Coordination Agreement (1964)
- Libby Coordination Agreement (February, 1964)
- Libby/Canadian CRT Storage SWAP (2002)
- Summer CRT Storage Agreement (July 2001)
- CRT Entity Agreement on Operation of CRT Storage for Non-Power Uses for January 1 through July 31. (2001)
- Whitefish Agreements (prior to 2001).

The variability of the river and the different potential development sites meant that extensive information was necessary to reduce uncertainty around the nature of the resource in question, as well as developing an equitable agreement. Furthermore, it ensured an equal playing field in terms capabilities and engineering. Again, the role of IJC in joint fact finding allowed a high level of information exchange to occur, including socio-economic interests (Krutilla, 1976; Le Marquand, 1993; Sewell and Utton, 1989; Swainson, 1986). Moreover, the role of the IJC over some 20 years allowed the parties to build a common vision together over time and progress at a reasonable pace.

In terms of negotiating interests, there appeared to be considerable effort made to address the interests of the countries which played a significant role in ensuring an agreement. On one hand, Krutilla (1976) felt that Canada had more of her interests met at the expense of the United States. On the other hand, Le Marquand (1977) indicates, that while the agreement was mutually beneficial in principle, it was far too inflexible and intransigent from an economic point of view, and this was to Canada's detriment. "Acceptance of a one time lump sum payment for downstream benefits [30 year sale of power benefits and 60 years of flood control] proved to be too risky" (Le Marquand, 1977).

Nevertheless, the entities continue to attempt to address each others interests as indicated by the subsidiary agreements, which were developed over time to accommodate emerging issues. Moreover, there is a built in flexibility into the actual

operating agreements allowing for yearly and seasonal alterations of flow to assist new issues such as fisheries, or operational concerns (Hearns, 2008).

More recently, the stability of the CRT has been under question for a number of reasons. One of has been the rise of fisheries and environmental interests, which have become increasingly important since the CRT was negotiated (Baker et al. 2010). The US Congress has passed environmental legislation, including: the National Environmental Policy Act of 1969 (NEPA), the Clean Water Act of 1972 (CWA), and the Endangered Species Act of 1973 (ESA). In Canada, similar legislation has appeared at the federal level, including: the Canadian Environmental Protection Act (1999), Canadian Wildlife Act (1985), Fisheries Act (1985), the Water Act (1985), and the Species at Risk Act (2002). The promulgation of such legislation illustrates a growing awareness and appreciation for environmental issues that were not accented in the years leading up to the signing of the CRT. Much of the emerging environmental concerns, in particular issues surrounding environmental fish flows, have been accommodated to date through alterations and modifications to the Assured Operating Plan through mutual consent (CRT-Entities, 2006, 2008; PEB, 2002). Due to the built-in flexibility of the CRT, emerging social and environmental concerns have not forced its revision.

Another cuase for reviewing or updating the Treaty is the fact that the Treaty is less related to current developments in energy generation in the region than it was anticipated for. The Treaty tells the entities to estimate downstream power benefits while also taking into account how the system will be optimized with regard to a regional power system that included thermal generation too. This was in part because it was assumed that thermal power would become increasingly important in the region. It does not, however, allow planners to take into account the wind generation on the system, which has become an important factor in Bonneville Power (US entity) planning and operations.

One of the principle complaints about the CRT is its lack of process for public

participation and its need to be updated to address social concerns and deal with compensation for past ills (Banker et al., 2010). In contrast to local stakeholders, the interests of regional actors, in particular British Columbia, but also state interests in the US, were well incorporated into the development of the CRT (Krutilla, 1976; Swainson, 1979; Loo, 2004).

The importance of a neutral party, even between parties with good relationships and symmetrical interests, is highlighted by the activities and role of the IJC in the development of the CRT. Not only did the experts express its importance in terms of information gathering and sharing but also in terms of developing principles upon which the CRT was based (Swainson, 1979; Bankes, 1996; Krutilla, 1967; Le Marquand, 1993; Lepawsky, 1963).

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