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British Columbia Hydro and Power Authority

Supply Chain Applications
Project Application

Decision
and Order G-158-17

October 19, 2017

Before:
D. A. Cote, Panel Chair
M. Kresivo, Q.C., Commissioner
R. I. Mason, Commissioner

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Executive summary

On December 21, 2016, British Columbia Hydro and Power Authority (BC Hydro or the Company) filed, pursuant to section 44.2 of the *Utilities Commission Act* (UCA), an application with the British Columbia Utilities Commission (Commission) seeking acceptance of the capital expenditures up to the end of the Definition Phase of a Supply Chain Applications Project (SCA Project) (Application). BC Hydro proposed the SCA Project be reviewed in a two-phase regulatory process, through which it would seek acceptance of the remainder of the capital expenditures prior to the start of the project Implementation Phase. This approach to the project review was accepted by the Commission by Order G-32-17 issued on March 15, 2017.

The SCA Project is BC Hydro's proposal to replace its existing PassPort supply chain IT system, Asset Suite 8, with an SAP-based IT system and to make improvements to its supply chain business processes for third-party materials and service acquisitions. BC Hydro states the benefits of the SCA Project include improved efficiency, risk reduction, and materials and services cost savings.

The Panel's review of this Application focused on five issues: project need, alternatives, benefits and financial impacts, risks and costs.

Project need

BC Hydro reports that in 2016 approximately $2.5 billion in third party services and materials were purchased through its supply chain from over 5,000 different suppliers. It has identified 13 capability gaps in its assessment of the current system and processes and states that the current PassPort system, in place since 2003, does not meet its current business requirements. BC Hydro believes the SCA Project, as defined, will close these capability gaps in a manner which justifies the investment through net financial benefits, which it submits were determined conservatively. Given the capability gap issues raised, the Panel finds the current supply chain system employed is inadequate for the size and complexity of BC Hydro and determines there is a need to address this.

Project alternatives

BC Hydro conducted an evaluation of two alternatives for its technology platform: an upgraded version of its Asset Suite 8 system currently in use and a new SAP supply chain solution. BC Hydro argues these were the best choices due to Asset Suite 8 being the current supply chain application, and SAP being deemed viable in its conceptual Design Report as well as being considered "best of breed" in third party studies. The Panel agrees. The Panel also agrees with BC Hydro's assessment that a move to the newer Asset Suite 9 would not be advisable given the impact on risk mitigation and the additional work this would require.

Questions were raised with respect to whether BC Hydro had the expertise to conduct the evaluation of PassPort. In consideration of the combined experience of the evaluation team, the Panel finds the evaluation team to be experienced and capable of performing the evaluation. With respect to the actual evaluations, the ability of the two systems to fill the capability gaps strongly favoured SAP with a score of 50 out of a possible 52 points. PassPort's Asset Suite 8 with upgrades scored 37 points. Given the experience of the evaluation team and the respective scores on the evaluation, the Panel finds the work BC Hydro has done to identify and evaluate alternative supply chain applications is reasonable and its selection of SAP (ECC6/Ehp8) is justified.

Project benefits and financial impacts

BC Hydro outlined its expectations regarding the benefits flowing from the implementation of the SCA Project. Benefits were classified into three categories, reducing cost, effort or risk for BC Hydro. BC Hydro monetized the cost and effort reduction benefits in a base case resulting in a net present value (NPV) of cash flows of $68.3 million with a range of $2.2 million to $103.2 million between a low and high scenario of benefits achieved.

Anticipated benefits from reducing or eliminating risks were not monetized because of insufficient information to calculate the economic benefit, although it is expected there will be reduced or avoided costs. The Panel considered the likelihood of achieving the identified benefits and the reasonability of the calculated quantum of benefits, and finds the work which has been done to identify and quantify the value of benefits resulting from implementing the SCA Project to be reasonable**.** Further, the Panel is satisfied that this work is sufficient to justify continuing to complete the definition process.

Project risks

BC Hydro submits the SCA Project has a moderate overall level of risk. It has developed a risk register outlining the likelihood of occurrence and consequences of each risk, and mitigation plans. The Company also has a Risk Management Plan in place to manage these risks, and expects that project risks will be reduced through the course of the Definition Phase as its mitigation plans are advanced. Based on the evidence, the Panel is satisfied the approach to project risk management employed by BC Hydro is appropriate.

Project costs

With respect to total project costs, BC Hydro estimates a mid-range cost estimate of $65.9 million with upper- and lower-bound cost estimates ranging from $60.5 million to $79.3 million. In this proceeding, acceptance of capital expenditures ranging from $22.2 million to $29.7 million to complete work to the end of the Definition Phase are requested. Noting that they are supported by an AACE International Class 3 estimate, the Panel finds the proposed lower-bound and mid-range cost estimates, in total and up to the end of the Definition Phase, are supported by their respective cost breakdowns and are reasonably robust.

Panel determination

Based on the above findings, the Panel finds capital expenditures ranging from $22.5 million to $29.7 million required to complete work up to the end of the Definition Phase of the SCA Project are in the public interest and accepts them**.**

Phase Two requirements

BC Hydro proposes the following at the end of the Definition Phase:

- The filing of a verification report updating the cost, benefits, scope, and schedule information of the SCA Project based on the completed Definition Phase work; and
- The Commission issue a Phase Two order accepting capital expenditures of the Implementation Phase as being in the public interest with minimal regulatory process, if the cost, benefits, scope and schedule assumptions do not materially change compared to what was reviewed in the Phase One proceeding.

Noting that capital expenditures for the total project have not been accepted, the Panel finds there may be a requirement for a more comprehensive review at the end of the SCA Project Definition Phase. Pointing out that BC Hydro intends to provide information in addition to the verification report, the Panel does not accept the criteria proposed by BC Hydro as the only criteria to be considered in the Phase Two Review. Accordingly, BC Hydro is directed to file, at the end of the SCA Project Definition Phase, a Phase Two verification report; the form of which is detailed in section 4.0 of the Decision.

1.0 Introduction

1.1 Application and approvals sought

On December 21, 2016, British Columbia Hydro and Power Authority (BC Hydro or the Company) filed, pursuant to section 44.2(1)(b) of *the Utilities Commission Act* (UCA), an application with the British Columbia Utilities Commission (Commission) seeking acceptance of the capital expenditures up to the end of the Definition Phase of a Supply Chain Applications Project (Application).

BC Hydro proposed the SCA Project be reviewed in a two-phase regulatory process. BC Hydro is seeking an order that would accept the capital costs of the SCA Project up to the end of the Definition Phase of the project, including costs in work-in-progress relating to early design work, as being in the public interest. Specifically, this is an application for acceptance by the Commission that BC Hydro undertake and complete Phase One, or the Definition Phase, of the SCA Project with a range of capital expenditures in the amount of $22.5 to $29.7 million.[1]

In Phase Two of the proceeding, BC Hydro submits that it will request acceptance of the balance of the project capital expenditures to be incurred for the Implementation Phase.

The Application provides BC Hydro's justification for undertaking the whole of the SCA Project and its choice of SAP as the platform, including the project need, scope, cost, benefits and risks. BC Hydro provided its analysis and projects the total expected capital cost of the SCA Project will be between $60.5 million and $79.3 million with a committed in-service date in Q2, 2020.[2] Although the Panel addresses whether to accept the capital expenditure for the first phase of the project only, we believe it is important to do so in the context of considering the full project and the expected cost of the entire project. However, for clarity, the Panel makes no determination as to whether to accept capital costs of the entire SCA Project as being in the public interest in this Decision.

BC Hydro submits that the evidence laid out in the Application demonstrates that capital expenditures on the SCA Project will improve efficiency and reduce BC Hydro's costs and risks of acquiring and deploying third party services and materials and is therefore in the public interest. According to BC Hydro, the new improved efficiency, risk reduction and cost savings, advance the objective of ensuring that BC Hydro's rates remain among the most competitive of rates changed by public utilities in North America.[3]

1.2 Application review process

On January 13, 2017, the Commission established a regulatory review process for the Application, which included one round of information requests (IRs) and a procedural conference with further process to be determined.

This was a robust hearing process, with a number of interveners. The following five interveners registered and participated in the proceeding:

[1] Exhibit B-1-1, p. 1-2.
[2] Ibid., p. 1-1.
[3] Ibid., Attachment C, p. 3.

- FortisBC Energy Inc. and FortisBC Inc. (collectively FortisBC);
- Commercial Energy Consumers of British Columbia (CEC);
- British Columbia Old Age Pensioners' Organization *et al*. (BCOAPO);
- ABB Enterprise Software (ABB); and
- Richard Landale.

On March 10, 2017, a Procedural Conference was held in Vancouver to review a number of issues, including whether there should be a written or oral hearing, and the merits of a two-phase regulatory process, as opposed to a single approval of the total capital expenditures of the SCA Project. BC Hydro, CEC, BCOAPO and ABB attended and participated. Mr. Richard Landale filed a written submission with the Commission on March 8, 2017 with respect to these issues.

At the Procedural Conference, BC Hydro submitted that it proposed a two-phase hearing process for three reasons: (i) to bring the project to the Commission before spending a significant portion of the total project cost; (ii) to avoid a lengthy delay between the Definition and Implementation phases of the project; and (iii) to provide the Commission with an opportunity to review the project at two key stages.[4] BC Hydro had indicated that the project entails three phases: the Identification Phase(Pre-work), the Definition Phase(Phase One), and the Implementation Phase(Phase Two). BC Hydro has, to date, completed the Pre-work and early Definition Phase work, including the filing of this Application. There was agreement amongst the parties at the Procedural Conference that a two-phase review was best for this particular project.

In Phase Two, BC Hydro proposes to file with the Commission a "verification report" which will either confirm that the cost, benefits, scope and schedule assumptions as set out in the Application have not materially changed throughout the Definition Phase of the project, or provide explanations for any material changes in the cost, benefits, scope or schedule assumptions. If in the Phase Two verification report there are no material changes to the cost, benefits, scope and schedule assumptions, BC Hydro proposes the Commission issue an order accepting the capital expenditures for the project Implementation Phase as being in the public interest with minimal regulatory process.

Following the Procedural Conference, the Panel determined that, although unusual, a two-phase regulatory process as opposed to a single phase is appropriate and issued Order G-32-17.[5] In addition, parties were invited to comment on the nature of the second phase review as part of their final submissions. Order G-32-17 established a regulatory timetable for the remainder of the proceeding, which included a second round of IRs, a process for ABB to submit intervener evidence, IRs on intervener evidence, rebuttal evidence, IRs on rebuttal evidence, and final and reply submissions.

2.0 Proposed project

2.1 Overview of the project

BC Hydro proposes to embark on the SCA Project, which is a major project providing for new supply chain software and business processes, which BC Hydro submits will allow it to more efficiently and effectively manage third party materials and service acquisitions. The "supply chain" refers to the business processes BC Hydro uses to acquire third party services and materials and deploy them within the company.[6] The SCA Project involves the design and implementation by BC Hydro of new business processes and information technology related to the acquisition and deployment of these services and materials. The scope of the SCA Project includes

[4] Exhibit A-5, Order G-32-7, Appendix A, p. 2.
[5] Ibid., p.2.
[6] Exhibit B-1, p. 1-1.

the installation of a SAP-based system for materials management, purchasing, and integration with other SAP modules (e.g. Finance) previously implemented by BC Hydro.[7] It will replace BC Hydro's existing supply chain IT system and will, according to BC Hydro, enable it to make improvements to its supply chain processes to improve efficiency, reduce risk and reduce costs.

BC Hydro's current core supply chain system, the PassPort IT system, has been in place since 2003. The Company advises that since 2003, its third-party service and material needs have substantially increased as annual capital expenditures have increased from about $600 million in 2003 to roughly $2.3 billion in 2016. In addition, operating costs have increased from approximately $580 million in 2003 to over $950 million in 2015. BC Hydro states it expects the level of annual capital expenditures to be in the $2 billion range for at least the next ten years and operating costs to increase over the long-term. The Company submits these increased spending levels make a cost-effective supply chain more important than it has been at any time in BC Hydro's recent history.[8]

According to BC Hydro, PassPort and BC Hydro's existing business processes have limitations when viewed in the context of its current business requirements.[9] BC Hydro states that PassPort has functioned well in many respects, but was developed when the Company had different supply chain business requirements, and is limited in the context of its current supply chain business needs. BC Hydro seeks to replace PassPort with a SAP IT platform that it submits can meet its current and future business needs, reduce risk and provide benefits for supply chain activities throughout BC Hydro.[10] It states the new system will allow it to close a number of capability gaps that exist in the current supply chain technology and processes, resulting in reductions in cost, effort and risk.[11]

BC Hydro has identified 64 specific benefits which it states are achievable and will result in reduced costs, effort and risk. The financial value of these cost and effort benefits have been estimated in monetary terms and then discounted to be conservative. BC Hydro believes that its proposed investment in a new supply chain will reduce business risk and yield annual recurring expected benefits of $27 million, corresponding to a net present value (NPV) of $74 million on a discounted cash flow basis and an NPV of $59 million on a revenue requirements basis.[12]

During the Application review process, BC Hydro revised these projections in response to IRs. The revised annual potential benefit and NPV figures are set out below:[13]

Table 1 – NPV of Discounted Cash Flows (millions)

	Mid	Low	High
SAP (Dec 21, 2016 Application)	74.4	6.4	111.6
SAP (Updated)	68.3	2.2	103.2
PassPort (Dec 21, 2016 Application)	39.4	(43.6)	75.8
PassPort (Updated)	34.2	(47.3)	68.5

[7] Ibid., p. 4-12.
[8] Ibid., p. 1-5.
[9] Ibid., p. 1-1.
[10] Ibid., p. 1-1.
[11] I bid., p. 1-5.
[12] Ibid., p. 1-6.
[13] Exhibit B-6, BCUC IR 2.39.2.

Table 2 – NPV of Incremental Revenue Requirements Impact (millions)

	Mid	Low	High
SAP (Dec 21, 2016 Application)	59.0	(4.0)	94.0
SAP (Updated)	53.5	(7.8)	86.2
PassPort (Dec 21, 2016 Application)	36.6	(39.1)	69.9
PassPort (Updated)	31.8	(42.5)	63.2

BC Hydro explains the changes noted above are the result of five numerical changes to the inputs of the SCA Project's financial model – four of these changes were related to the calculation of certain benefits in the model and one was to reflect a change in the scoring of Passport's ability to close one of the capability gaps. Although these changes had no impact on the cost estimates for either the SAP or PassPort alternative, they did reduce the benefits, which in turn reduced the NPV of both discounted cash flows and incremental revenue requirements.

The total expected capital cost of the SCA Project is $59.2 million, with a project capital cost range of between $54.3 million and $71.8 million. BC Hydro anticipates that the SCA Project can be placed in service by the end of July 2019 at a total cost of between $60.5 million and $79.3 million.[14]

2.2 BC Hydro's capability to undertake the project

BC Hydro is a Crown corporation established in 1962 and is mandated to generate, distribute and sell electricity, upgrade its powered sites, and purchase power from or sell power to a firm or person. BC Hydro is the largest electric utility in BC, serving over 94 percent of the population in the province.[15]

BC Hydro states that in order to take on a project of this magnitude and complexity it must show it has the financial, technical and project resources to succeed. BC Hydro asserts it has met all of these requirements.[16]

BC Hydro submits it has the capacity to borrow money directly from the Province, borrow money that is guaranteed by the Province or use funds generated internally from the operation of its business. BC Hydro did not indicate or commit specifically how it will finance this project.

BC Hydro's bonds are currently rated well by all three rating services. Specifically, BC Hydro's bonds are rated as follows:

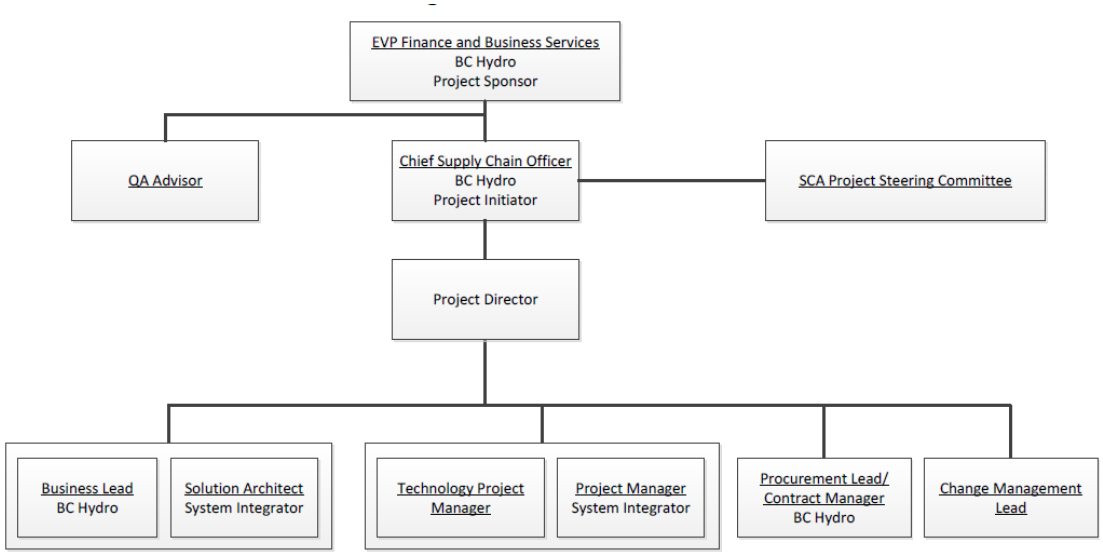
- Standard and Poor's Bond Rating Service – AAA;
- Moody's Bond Rating Service – Aaa; and
- Dominion Bond Rating Service – AA.[17]

BC Hydro asserts that it has significant experience in implementing SAP technology projects. In 2003, the Company implemented its first SAP IT system. In 2008, BC Hydro decided to shift to an enterprise-wide SAP IT Platform. Since that time it has implemented three major SAP projects: i) Financial Systems Replacement Project; ii) Human Resources Project; and iii) Project and Portfolio Management.[18] In addition, it has implemented other smaller SAP projects involving preparatory design work, enhancements and partial system implementation, including two supply chain specific SAP projects.

[14] Exhibit B-1, p. 1-6.
[15] Ibid., p. 1-10.
[16] Ibid., p. 1-10.
[17] Ibid., p. 1-10.
[18] Ibid., p. 1-11.

BC Hydro asserts it has the appropriate project team and governance structure to effectively handle the SCA Project. BC Hydro's SCA project team is composed of full-time BC Hydro employees and consultants who have experience in the design, development and implementation of IT projects. BC Hydro provided an outline of the team structure and roles in the figure below.[19]

Figure 1 – Supply Chain Applications Project Team Organization Chart



Following a public, multi-stage procurement process, the Company selected a System Integrator and a Quality Assurance Advisor to assist in assuring the project is completed appropriately and within the budget and timelines proposed.

The System Integrator is responsible for providing advisory and implementation services to help BC Hydro develop process and solution designs and implement the designed solution. The preferred proponent for the System Integrator is Pricewaterhouse Coopers (PwC). Although BC Hydro has not yet signed a contract with its preferred proponent, it has received fixed pricing and validated its view on the resources required, the design completed to date, and the amount of time required to finish the preliminary design and implement the SCA Project. The Company advises that it does not intend to execute the Master Services Agreement until the Commission accepts as in the public interest the Definition Phase capital expenditures for the project.

The Quality Assurance Advisor will provide independent oversight and ongoing assessments of the governance structure, process and staffing and project status. The primary objective of the Quality Assurance Advisor is to help BC Hydro identify, manage and mitigate risks. BC Hydro entered into a contract with KPMG in March 2016 and prepared an Interim Project Readiness Assessment, which is discussed in section 2.5.2.1 of this Decision.

BC Hydro advises that it intends to involve approximately 60 full-time people on the project team, expanding to approximately 80 full-time team members during the Implementation Phase. It also intends to set up a working group of approximately 15 senior managers and directors directly responsible for areas of the business impacted by the project and responsible for the approval of the Supply Chain Applications Blueprint and the successful adoption of the project during the Implementation Phase. A third team, referred to as the Advisory Team, will be composed of approximately 30 to 50 representatives from across BC Hydro directly impacted by the design and deployment of the new supply chain. This team is meant to ensure the Supply Chain Applications Blueprint will meet the business need and ensure change management and training plans are appropriate.[20]

[19] Ibid., Figure 1-1, p. 1-11.
[20] Ibid., pp. 1-15 – 1-16.

2.3 Supply chain IT at BC Hydro

There is considerable history of review and changes to the supply chain IT at BC Hydro. The Province and BC Hydro have reviewed the supply chain, identified gaps and improvements required. We review below the history of supply chain IT reviews and changes below.

PassPort and SAP

In 2003, the Company implemented the PassPort system and associated business practices for work management and supply chain. BC Hydro advises that the PassPort system was designed primarily to support materials and inventory management and not the acquisition of services or non-inventoried materials.

In 2003, BC Hydro also implemented its first SAP IT system and associated business practices. Specifically, BC Hydro installed SAP's primary application - SAP ERP Central Component. This is a single application comprised of a series of modules that stores data in a single database. The single database enables SAP ERP Central Component to share data across its modules without the need for interfaces. BC Hydro activated the customer care module of SAP.[21]

Procurement Enhancement initiative

In 2007, BC Hydro began a Procurement Enhancement Initiative, which had two components: Procure-to-Pay and Strategic Sourcing. Procure-to-Pay was implemented to establish controls in supply chain. The goal of Strategic Sourcing was to aid in achieving direct cost savings in materials acquisition by taking a longer-term view of acquisition decisions and aggregating spending.

Adoption of SAP as an enterprise wide platform

In 2008, BC Hydro made a decision to shift to an enterprise-wide SAP IT platform to allow all core business process to be consolidated onto a single IT platform. [22] Since 2008, BC Hydro implemented a number of SAP solutions, including the following SAP modules in the corresponding year: Finance (2010), Human Resources (2011) and Project and Portfolio Management (2011).[23] BC Hydro has also installed non-SAP solutions where the alternative to SAP was, in their view, materially superior.

Transformation Initiative

In 2010, the BC Transmission Corporation was integrated with BC Hydro. At that time, the Transformation Initiative was set up to implement a new operating model for the transmission and distribution business group, which involved changes to the organizational structure, processes and technology. [24] In 2011, the scope of the Transformation Initiative expanded to include a review of business process efficiencies and supporting IT investments across the company, including work management and asset management. In 2013, the supply chain was added to the Transformation Initiative.[25]

The Province's review of BC Hydro

In 2011, the Province performed a review of BC Hydro and prepared a report entitled *Review of BC Hydro*, in June 2011 (Report). The Report included a number of recommendations for improvements to BC Hydro's supply chain, including recommendations suggesting a number of improvements including (but not limited to) the following:

[21] Ibid., p. 4-4.
[22] Ibid., p. 4-3.
[23] Ibid., p. 4.4.
[24] Ibid., p. 4-4.
[25] Ibid., p. 4-4.

- Improvements to materials supplies management;
- Implementation of BC Hydro's technology projects to support electronic ordering, receipt and payment of goods and services;
- Investigating opportunities to streamline and consolidate the procurement of common goods or services; and
- Ensuring procurement staff is sufficiently trained and continuously updates their knowledge around procurement.[26]

Supply Chain Business Model

In 2012, BC Hydro initiated the development of a Supply Chain and Fleet Operations Business Model (Supply Chain Business Model). The Supply Chain Business Model report was completed in spring of 2013 and describes the optimal configuration for BC Hydro's supply chain.[27] The report sets out 153 supply chain specific business requirements (Supply Chain Business Requirements). In late 2013, BC Hydro began to implement the Supply Chain Business Model, beginning by reorganizing the business units responsible for supply chain into a centralized structure (Supply Chain Business Unit).

Transformation Blueprint

By 2012, the Transformation Initiative included the following components: asset and resource planning; customer connections; work management; contractor strategy; and operations performance (Components). [28] In addition, the Transformation Initiative identified four IT projects that dealt with asset management; work management; scheduling, dispatch and mobility; and customer connections (Projects). These Projects were focussed on delivering the required functionality within BC Hydro's SAP platform.[29]

BC Hydro proposed that the Components and the Projects were to be on an SAP platform. BC Hydro prepared a single integrated preliminary design for the Components and the Projects, which BC Hydro refers to as the Transformation Blueprint. Informed by the Supply Chain Business Model, a portion of the preliminary design of the SCA Project was completed as part of the Transformation Blueprint.

By late 2013, BC Hydro decided to implement the Transformation Blueprint "on a measured basis,"[30] assessing each of the Transformation Blueprint IT Projects separately. As of March 2014, the total expenditures for the Transformation Blueprint IT Projects were about $33.3 million, including about $15.5 million for the supply chain component. BC Hydro provided a summary of the total costs incurred for the Transformation Blueprint work related to its supply chain in the following table:

[26] Ibid., p. 4-4.
[27] Ibid., Attachment K.
[28] Ibid., p. 4-6.
[29] Ibid., p. 4-7.
[30] Ibid., p. 4-8.

Table 3 – Summary of Transformation Blueprint Work Related to BC Hydro's Supply Chain

Project Name	($ million)		
	Capital	Operating	Total
Supply Chain Solutions - SharePoint	2.7	0.4	3.1
Supply Chain Solutions - SAP	1.5	0.2	1.7
Supply Chain Solutions – Meters	.04	nil	.04
Total - Supply Chain Solutions projects	**4.2**	**0.6**	**4.8**
Supply Chain Management[1]	**9.4**	**1.3**	**10.7**
Total[2] **- Supply Chain Transformation Blueprint Costs**	**13.6**	**1.9**	**15.5**
Less: Supply Chain Management - Operating		**(1.3)**	**(1.3)**
Total	**13.6**	**0.6**	**14.2**

Note 1: A total of $9.4 million in capital costs were incurred on the Supply Chain Management project as of March 2016. Approximately $2.1 million of the costs were written off in fiscal 2016.

Note 2: The amounts in the table may reflect differences due to rounding.

As seen above, approximately $4.8 million in costs were allocated across three of the four Supply Chain Solutions IT projects which formed a Supply Chain Solutions Program.

As of April 1, 2015, the work-in-progress (capital) balance of the supply chain portion of the Transformation Blueprint was $9.4 million. The Company recorded a write down of $2.1 million of the $9.4 million, resulting in a remaining balance of about $7.3 million. BC Hydro submits this is the appropriate value to carry forward into the Supply Chain Applications Project since it reflects money spent on projects which are useful and relied on as part of this project. This is discussed further in section 3.5 of the Decision.

Supply Chain Solutions Program

In 2014, BC Hydro implemented the Supply Chain Solutions Program, consisting of four IT projects to improve supply chain management.

The four IT projects that were part of the program to improve supply chain management were as follows:

- Supply Chain Solutions – SAP: This project includes implementation of the following: inventory management and purchasing for electric meters in SAP and a tool for better managing changes to material and vendor records in SAP;
- Supply Chain Solutions – Meters: This project replaced an end of life custom application with SAP's meter management module;
- Supply Chain Solutions – PassPort: This project made minor improvements to the PassPort system and Ariba e-commerce interface; and
- Supply Chain Solutions – Sharepoint: This project developed a system for managing supply chain documents using a Microsoft IT platform called Sharepoint.

BC Hydro submits the successful implementation of the Supply Chain Solutions – SAP Project increased its experience with and confidence in SAP as the most suitable and preferred IT solution and will help mitigate the delivery risk associated with the SCA Project.[31]

[31] Ibid., p. 4-11.

2.4 Scope of the SCA Project

The scope of the SCA Project includes the installation of a SAP-based system for materials management, purchasing, and integration with other SAP modules.[32] The SCA Project will replace significant parts of BC Hydro's existing supply chain, including business processes and supporting IT system. The full scope of the SCA Project is set out in the Conceptual Design Report.[33]

Specifically, the scope of the SCA Project includes the installation of functional SAP-based systems for the following core components of the BC Hydro supply chain:

- Materials management: inventory management, forecasting and demand planning, material requirements planning and warehouse operations for all materials.
- Purchasing: purchasing processes, contra administration and invoice processing for all materials and services.
- Integration: integration of SAP Supply Chain modules with other previously implemented SAP modules (Project System, Finance & Controlling, Quality Management and other systems such a PassPort (work management), Oracle Primaver Unifier Construction Contract Management and Supply Chain Workspace (sourcing, category and contract management).[34]

The SCA Project will also expand BC Hydro's use of the following applications:

- SAP Business Warehouse, which is SAP's data warehousing and reporting application;
- Ariba, which is an e-commerce application used for sharing purchasing data electronically with vendors; and
- Fiori, which is technology for developing user-friendly screens in SAP.[35]

2.5 Phases of work

As described in section 1.3 above, there are essentially three phases of work for the SCA Project: Identification Phase (Pre Work), Definition Phase (Phase One) and Implementation Phase (Phase Two). These are discussed in more depth in the following sections.

2.5.1 Identification Phase

Prior to the Application, BC Hydro began the Identification Phase work for the SCA project. This began in November 2014 and was completed by March 2015.

This phase of the work provided a review of the Supply Chain Business Requirements, a conceptual design report, an initial stakeholder impact assessment, identification of resourcing options and identification of procurement options as discussed below.

Review of Supply Chain Business Requirements

BC Hydro retained PwC to review the Supply Chain Business Requirements identified in the Supply Chain Business Model and confirm the Supply Chain Business Requirements are still applicable.[36]

[32] Ibid., p. 4-12.
[33] Ibid., Attachment H.
[34] Ibid., p. 4-11.
[35] Ibid., p. 4-12.
[36] Ibid., p. 4-13.

Conceptual Design Report

The Conceptual Design Report describes at a high level how SAP will be implemented to address the Supply Chain Business Requirements.[37] The Conceptual Design Report identified the scope of SAP functionality to be implemented, the integration with previously implemented SAP modules, the interfaces that would be required between SAP and existing non-SAP IT systems, and how people will interact with the new supply chain. BC Hydro engaged PwC to assess the conceptual design. PwC confirmed the Conceptual Design supports the Supply Chain Business Requirements and delivery of the Supply Chain Business Model, and addresses 150 of the 153 Supply Chain Business Requirements (three business requirements not addressed by the conceptual design do not require technology).[38]

Initial Stakeholder impact assessment

BC Hydro undertook an initial assessment of the impacts of the SCA Project on internal and external stakeholders which confirmed the project will result in a high degree of change for its employees, contractors, and suppliers. BC Hydro advises that it intends to prepare detailed impact and training needs assessments during the Definition Phase.

Identification of resourcing options

BC Hydro assessed whether to retain a System Integrator for the project, and, if so, what the scope of the System Integrator's role on the project should be. BC Hydro considered four options and selected the option it believes provides the best opportunity to reduce project risk by leveraging the experience, methodology and teamwork of a system integrator, while allowing BC Hydro to utilize project standards that have proven to be effective in managing IT projects at BC Hydro.

In the selected option, BC Hydro will retain a System Integrator, but the SCA Project will be implemented in accordance with BC Hydro's project standards. BC Hydro will retain ultimate responsibility for the project, while the System Integrator will have responsibility for the day-to-day coordination and execution of activities. The System Integrator will be the primary source of, and have responsibility for, people who work on the project. The System Integrator's methodology will be adapted to align to BC Hydro's project standards and used to develop the project. Certain specialized resources for the project will be retained either through the System Integrator or through BC Hydro, as required.[39]

Procurement approach

BC Hydro developed a procurement process to retain the System Integrator, which is the single largest cost of the SCA Project. The Company states that a Request-for-Proposal has been completed with respect to the System Integrator. It provides BC Hydro with a high degree of certainty for a significant portion of the project costs and confidence in the project timeline.[40]

2.5.2 Definition Phase

The Definition Phase of the project is divided into the following three phases of work:

- Early Definition Phase
- Mobilization Stage
- Design and implementation Planning Stage

[37] Ibid., p. 4-13; Attachment H.
[38] Ibid., Attachment L; p. 4-13.
[39] Ibid., p. 4-15.
[40] Ibid., p. 4-17.

The Definition Phase costs include BC Hydro's resources assigned to the SCA Project and estimates of external project resources including the System Integrator and Quality Assurance Advisor.

2.5.2.1 Early Definition Phase

On March 30, 2015, the SCA Project was given approval from members of BC Hydro's executive team to begin work on the Early Definition Stage. The major deliverables for this stage are as described below.

Internal funding approval

BC Hydro advises that the Board of BC Hydro delegated authority to the CEO to approve the Definition Phase funding for the SCA Project and that in September 2015, BC Hydro's CEO granted funding approval for the Definition Phase of the project based on a preliminary cost estimate of $21 million, not including work-in-progress.[41] The CEO's approval was based on an estimated cost range of between $55 million and $75 million, and the financial benefits were assessed at a high-level to be from $15 million to $23 million annually.

Selection of System Integrator and Quality Assurance Advisor

BC Hydro has completed a multi-step public procurement process to select a System Integrator. The recommendation of PwC as the lead proponent was endorsed by the Supply Chain Applications Steering Committee.

PwC's best and final offer response included an assessment of the completeness of the Supply Chain Transformation Blueprint.[42] Fixed price estimates were provided for the Mobilization work package and for the remaining four work packages. PwC's best and final offer pricing is divided into five work packages:

1. Mobilization (Definition Phase);
2. Design (Definition Phase);
3. Realization – Build and Testing (Implementation Phase);
4. Final Preparation – User Acceptance Testing and Training (Implementation Phase); and
5. Stabilization – Post go live (Implementation Phase)

The Supply Chain Applications Steering Committee granted permission to conditionally award the System Integrator work to PwC and to work with PwC to develop and finalize the Master Services Agreement and Statement of Work for the Mobilization work package and the Design Work package. BC Hydro advises that it does not intend to execute the Master Services Agreement and Statements of Work unless and until the Commission accepts the capital expenditure as in the public interest and issues an order accepting the Definition Phase capital expenditures for the project.

BC Hydro used a public procurement process to select an independent Quality Assurance Advisor.[43] As a result of the process, BC Hydro identified KPMG as its preferred Quality Assurance Advisor. BC Hydro entered into a contract with KPMG in March 2016 to allow the Quality Assurance Advisor to prepare an interim project readiness assessment and a System Integrator procurement and selection process assessment.[44]

KPMG prepared an Interim Project Readiness Assessment which indicates "the overall SCA Project readiness activities completed by BC Hydro have been strong with much thought and diligence employed in the assessment of the need for change, planning and readiness for the next phase of the project."[45] KPMG did note

[41] Ibid., Attachment P.
[42] Ibid., Attachment G.
[43] Ibid., p. 4-21.
[44] Ibid., Attachment N.
[45] Ibid., Attachment N, p. 12.

a number of risks to the Supply Chain Application Project and made a number of recommendations. BC Hydro states that it prepared an action plan to address all the recommendation in its KPMG Interim Project Readiness Assessment Management Plan.[46]

Regulatory application and approval process

BC Hydro advises that the final deliverable of the Early Definition Stage is the preparation and filing of this Application. The Company does not intend to proceed into the next stage, the Mobilization Stage of the Definition Phase of the SCA Project, unless and until it receives an order in this Application (or Phase One) accepting the Definition Phase expenditures for the SCA Project. Therefore, the SCA Project continues to be in the Early Definition Stage until a determination is made.

2.5.2.2 Mobilization stage

According to BC Hydro, the Mobilization Stage is scheduled to take place over the month of October 2017. This scheduling is subject to the Commission accepting the capital costs of the Definition Phase of the project as being in the public interest, and the timing of that potential acceptance. The objectives of the Mobilization Stage are to work with the System Integrator to jointly develop detailed plans for the remainder of the Definition Phase, to create a joint BC Hydro and System Integrator project team, to train the project team on the SCA Project plans and procedures, and to establish the project working environment.[47]

2.5.2.3 Design and implementation planning stage

BC Hydro states that this is the most significant stage of the Definition Phase and is scheduled to last six months. The company has currently scheduled this phase to begin in November 2017 and conclude at the end of April 2018. BC Hydro states that the objective of this stage is to further develop the conceptual design to a preliminary design that articulates how business processes will be executed using the new IT system. The design activity is expected to proceed through a series of System Integrator-led design workshops that will each focus on a component of the conceptual design. The Conceptual Design, Supply Chain Business Requirements, Transformation Blueprint and the Supply Chain Business Model will be used as inputs to the design workshops.[48] The results will be recorded and will be the Supply Chain Application Blueprint. The implementation planning activities will include using the Blueprint to establish the time and effort required to complete the implementation of the project, its adoption by the business units and the delivery of the benefits.[49] At this time the Company will also refine the monetized benefits anticipated.

2.5.3 Implementation Phase

In Phase Two of the proceeding, BC Hydro submits it will present its refined analysis of the SCA Project based on the Definition Phase work and will request acceptance of the balance of project capital expenditures to be incurred for the Implementation Phase.

The implementation is scheduled to take approximately one year. BC Hydro anticipates starting on the Implementation Phase in May of 2018. The major activities to be completed during the Implementation Phase include:

[46] Ibid., Attachment O.
[47] Ibid., p. 4-23.
[48] Ibid., p. 2-24.
[49] Ibid., p. 4-24.

1. Configuration of the SAP system to support the designed business processes:
2. Development of the detailed design, including functional and technical specification documents, writing of custom program code and testing:
3. Testing of the new business processes and IT system;
4. Extraction, transformation and loading of required data from legacy application, primarily PassPort, into SAP;
5. Design and development of end user documentation; and "how to" procedures;
6. Communication and change management activities;
7. Development and delivery of end-user training;
8. Planning and executing the "go-live" event;
9. Stabilization of the implemented business processes and IT systems; and
10. Transition of support activities for the new processes and IT systems.[50]

BC Hydro states that it anticipates implementation activities will continue for a year after the first year of implementation work to allow for stabilization and onboarding of the new technology and processes. It currently estimates that the SCA Project will be complete in approximately July 2020.

2.6 Project schedule and milestones

BC Hydro has provided detailed project milestones to completion of the project in July of 2020; Table 4 below sets out the key milestones and activities.[51]

Table 4 – SCA Project Key Milestones and Activities

Stage	Key Milestones and Activities
Application filed with British Columbia Utilities Commission	December 2016
British Columbia Utilities Commission Decision Issued for Phase One	August 2017
BC Hydro releases Mobilization, Design and Implementation Planning work to System Integrator and Quality Assurance Advisor	September 2017
Definition - Mobilization Activities	October 2017
Design and Implementation Planning	November 2017 to April 2018
British Columbia Utilities Commission Review of Verification Report & Phase Two Decision Issued	March to April 2018
BC Hydro releases Implementation Phase work to System Integrator and Quality Assurance Advisor	May 2018
Implementation - Build Solution[41]	May 2018 to March 2019
Target In-Service Date	Late March 2019
Committed In-Service Date	Late July 2019
Implementation – Stabilization	August 2019 to November 2019
Implementation – Onboarding	December 2019 to July 2020
Project Completion	End of July 2020

BC Hydro advises that the project schedule anticipates completing the Definition Phase by late April 2018 and moving directly into the Implementation Phase. This is contingent on approval by the Commission of the project and the timing of the approval.

[50] Ibid., p. 4-27.
[51] Ibid., p. 4-29, Attachment M.

The Company advises that the committed in-service date includes a four-month schedule contingency. Changes to the project that impact the schedule and are outside of BC Hydro's control, including changes to the regulatory schedule, are not included in this contingency.[52]

3.0 Project justification

3.1 Project need

BC Hydro defines its supply chain as the business processes used by BC Hydro to acquire and store third party services and materials and deploy them within the company. BC Hydro reports that in 2016 approximately $2.5 billion in third party services and materials were purchased through its supply chain from over 5,000 different suppliers. Approximately 85 percent of BC Hydro's capital spending and 55 percent of its operating costs are for third party services that must be procured using its supply chain system. On an annual basis almost 4,000 of its 5,500 employees or 72 percent have contact with the supply chain. This contact ranges from engaging third party personnel to be employed in its major projects to more simple items like the purchase of printer paper. BC Hydro reports that almost all of these items or services purchased are the subject of multiple business processes.

Some examples of discrete supply chain processes that BC Hydro expects to address include the following:

- creation and maintenance of vendor master data;
- creation of forecasts and plans for material requirements; and
- review of purchase requisition processes.

Common supply chain activities employing one or more of these business processes include the requisition and sourcing of materials and services as well as the management of contracts and inventory. BC Hydro states that if even a small amount of efficiency can be realized from each supply chain activity or business process the benefits can be significant.[53]

BC Hydro's existing core PassPort supply chain IT system has been in place since 2003. At the time the PassPort system was implemented there were different supply chain requirements, which the company now indicates, do not meet current business requirements. As noted previously, BC Hydro acknowledges the Passport system has functioned well in many respects," but was developed when BC Hydro had different supply chain business requirements." If approved BC Hydro believes the SCA Project will allow it to meet current and future business needs, reduce risk and benefit customers.[54] In addition, when complete, the project will satisfy either wholly or in part 150 of the 153 supply chain business requirements. These business requirements were identified through a formal process designed to assess supply chain needs across the organisation.[55]

BC Hydro reports it has conducted a gap assessment of its current supply chain IT system and related business processes. It has identified 13 capability gaps within its supply chain that the project is expected to close. These are outlined in the following:

1. **Inability to manage service-related spend** - BC Hydro estimates that 60 to 80 percent of its annual expenditures are for services it procures through its supply chain. Current supply chain systems do not allow it to easily track and view the different services it contracts and their costs. This has resulted in the Company being unable to develop a services catalogue listing the various types of services contracted

[52] Ibid., p. 4-28.
[53] Ibid., pp. 2-2 – 2-5.
[54] Attachment L of the Application summarizes these needs and provides some commentary on each.
[55] Ibid., p. 1-1; p. 4-13.

for and their price. Having such a catalogue will provide users better information on pricing and contract terms which will allow for the development of self service applications.

2. **Limited ability to manage contracts** – The current system has limitations with regard to visibility of important items such as contract terms, conditions and performance data. Because of this, users are required to work in multiple systems with contract terms not being readily accessible. This could result in a contract manager missing an opportunity to take advantage of volume discounts which may be available.
3. **Limited ability to manage inventory** – Currently, BC Hydro's assessment of inventory requirements is done manually as there is no automated process in place to assist with inventory management. This has a significant impact on its ability to manage inventory levels, handle rush orders and issue multiple orders of similar materials. As a result, there is a higher incidence of spot buying small quantities at a higher cost than if purchases were negotiated on a bulk basis.
4. **Limited ability to manage individual supplier performance** – Currently, there is no system to manage individual supplier performance. Processes for tracking performance metrics are manual, inconsistent, inefficient and subject to error. Tracking this information in an efficient manner would allow BC Hydro to avoid or eliminate some of the poor performing operators.
5. **Limited ability to manage the supply chain for capital projects** – All changes to schedule or scope are currently handled manually across various systems. This results in a greater expenditure of time and effort.
6. **Lack of order, delivery and payment tracking** – BC Hydro's supply chain has no consolidated system for tracking requests, receipt of materials, and delivery of services or payment details in a single application. Currently information is entered and managed in multiple applications requiring manual intervention by the operator when an issue arises.
7. **Inability to support sales and return of unused materials** – The current system has no capability to track the disposition of unused materials as the returns process requires significant manual effort. Consequently, there is a risk of unnecessarily replenishing stock when there is surplus in the field or another warehouse. This leads to unneeded inventory and increased costs.
8. **Inability to prepackage materials for field crews** – Being able to preassemble material for specific jobs or recurring jobs allows for greater efficiency and reduction in the effort required. BC Hydro reports that no such capability exists at present.
9. **Lack of wireless access to inventory information** – The lack of mobile access to available inventory means that greater effort is required to manage inventory and the information is less accurate resulting in higher inventory levels.
10. **No self-serve option for routine service requests** – Currently each request must be made accompanied by a written description of the specific service needed. A self-service drop-down menu would reduce effort and be more efficient.
11. **Inability to pay suppliers without an invoice** – All goods received must have an invoice and be manually matched against a contract. The current system does not allow for automatic payment without invoice where appropriate. If this were rectified this could result in lower per unit pricing on certain items.
12. **Inability to streamline controls and approvals process** – The approval process is described as inflexible. BC Hydro provides an example of this where appropriate project or work order approvals are not leveraged for contracts resulting in a redundant inefficient process with limited opportunity to streamline.

13. **Inability to integrate with work management systems** – Currently there is a lack of integration and interfacing between the current system and other primary systems. As a result, work orders created in any other system do not link directly with the current system and must be manually created to allow for materials and services to be planned.[56]

BC Hydro submits the project as defined will close these 13 capability gaps and do so in a manner that justifies the investment through net financial benefits which it believes were arrived at conservatively.

Intervener submissions

CEC submits that the supply chain business model is part of the common platform strategy and, to the extent it is presented as a stand-alone application, it should stand on its own merits. In its view, capability gaps should represent independent business needs, each requiring a solution, but in this case the business needs have largely been justified based on capability gaps associated with the transition to the common platform.[57]

ABB make no specific submissions with respect to whether there is a need for the project as their involvement in this process was to correct what it considers to be misinformation about perceived gaps between its product and what BC Hydro is proposing and how it could support the utility in moving forward to achieve its business objectives.[58]

BCOAPO submits the need for the project is directly tied to the shortcomings of the existing supply chain software as well as the processes which are argued to lead to cost inefficiencies and unnecessary risks. According to BCOAPO, in order for the Commission to accept these capital expenditures, "this Panel needs to be satisfied the project is cost effective and reduces risk."[59] BCOAPO makes no comment on the current situation and whether there is a need.

Mr. Landale provides no specific comment as to the need for the project, but by letter of June 2, 2017, indicates that he supports the project as applied for by BC Hydro.

BC Hydro reply submission

BC Hydro states that the Application stands on its own merits. It reiterates that the project's purpose is to implement a supply chain IT solution and a business process to meet the business requirements identified in the supply chain business model.[60]

In support of its position BC Hydro made the following submissions:

1. The Supply Chain Business Model is independent of the common platform strategy and is the outcome of a formal process to identify BC Hydro's supply chain needs across the organisation.
2. The current Application stands on its own merits and is designed to enable BC Hydro to meet its identified supply chain business needs.
3. As pointed out in the Application, BC Hydro has provided examples of where it has installed non-SAP systems where the alternative to SAP was materially superior.
4. The capability gaps were based on a gap assessment of the current supply chain IT system and business processes and reflect current system gaps and processes that must be filled to meet current business needs. The implementation of the Supply Chain Business model contemplates closing all of these capability gaps.

[56] Ibid., pp. 2-8 - 2-12.
[57] CEC Final Submission, p. 5.
[58] ABB Final Submission.
[59] BCOAPO Final Submission, p. 4.
[60] BC Hydro Reply Submission, p. 6.

Panel analysis and findings

The SCA Project and related processes are pervasive and touch over 70 percent of BC Hydro's employees, with annual expenditures of 2.5 billion through a list of over 5,000 vendors. In the Panel's view there is a need for a high-capability supply chain system to manage purchasing and related processes in a manner that is effective and efficient, and which allows for sufficient oversight of the process, the vendors and ongoing management of the supply chain.

BC Hydro has provided significant insight into its current supply chain management system and processes and has been clear in highlighting the capability gaps which currently exist and the impacts on the organization of failing to address these gaps. BC Hydro has demonstrated how the lack of flexibility has left it with a limited ability to manage contracts and no opportunity to streamline the system for greater efficiency or adapt it to a specific need such as providing an ability to pay suppliers without an invoice in some cases. It has also explained how the weaknesses in inventory management capabilities has left it with no automated process to manage inventory levels, determine where individual items reside or pre-package materials based on specific needs of the field crews. BC Hydro has also shown how the largest part of its annual expenditures is for services and the current system is unable to manage service related spend, resulting in users being restricted in terms of their ability to access better information on pricing and contract terms. Each of these is individually important and collectively has a direct impact on BC Hydro's ability to effectively manage its supply chain resources and operate its processes in a cost-effective manner.

Given the capability gap issues raised, the Panel finds the current supply chain system employed is inadequate given the size and complexity of BC Hydro and determines there is a need to address this. However, the Panel agrees with the points raised by BCOAPO with respect to cost effectiveness and risk reduction. The fact that there is a need to address a lack of capability or performance gaps does not necessarily define a particular solution. BC Hydro has proposed the SCA Project as the recommended solution to problems related to the current supply chain system. The proposed project needs to be reviewed in terms of its costs, benefits and financial impacts as well as whether there are other, more suitable alternatives to deal with supply chain system needs.

The Panel is not persuaded by CEC's submissions that the capability gaps have been justified on the basis associated with transition to the common SAP platform. As stated, BC Hydro has outlined in detail the capability gaps with its current system and the need for change in our view stands on its own merits. The issues related to the implementation of a common platform are not in scope for this hearing. However, the Panel notes that the utilization of such a strategy in the IT space is not an uncommon practice. Notwithstanding this practice, the Panel in this Decision has made its determinations on the basis of the evidence before it as to whether BC Hydro is proposing an appropriate choice of suppliers and systems to address its needs.

3.2 Project alternatives and analysis

Choice of alternatives

BC Hydro states that it evaluated two alternatives for its technology platform; one from PassPort, an ABB Enterprise Software (ABB) solution; and one from SAP. Under the PassPort alternative, BC Hydro would upgrade the currentlyin-use Asset Suite 8 system by implementing capabilities that are available but not presently used to close as many of the capability gaps as possible. Under the SAP solution it would implement a new SAP supply chain solution as described in its Conceptual Design Report. BC Hydro considers both of these to be viable noting that SAP has been confirmed to be viable in the Conceptual Design Report and PassPort is currently in use as its supply chain application. In addition, PassPort and SAP licenses and hardware needed for the new supply chain are already owned.[61]

[61] Exhibit B-1, pp. 3-2 – 3-3.

While BC Hydro considered whether other alternatives might be able to better fill capability gaps than Passport or SAP, it determined for the following reasons that another third-party IT system would be unlikely to provide a material advantage:

- No other alternative (including PassPort) would provide incremental functional benefits over SAP because SAP fully addresses the gaps;
- The necessary PassPort and SAP licenses and hardware for a new supply chain are owned, thereby saving costs;
- A third alternative would require new personnel with the system skills necessary to train existing personnel in the use of a new system and drive up costs and support resources could not be easily shared. The lack of experience would result in additional risk; and
- A third alternative necessitates the development of at least one additional set of interfaces to allow users of the new IT system to access the existing SAP and PassPort systems creating additional cost.[62]

In addition, BC Hydro noted that third-party studies support SAP (but not PassPort) as being a "best of breed" supply chain solution, asserting that it is ranked first for supply chain management applications and is also number one among procurement software vendors.[63] Given these considerations BC Hydro decided to limit its review to the existing PassPort Asset Suite 8 and the SAP (ECC6/EhP8) solutions.[64]

Evaluation of alternatives

Adding complexity to an evaluation of potential SCA alternatives was ABB's recommendation that the PassPort system be upgraded to a newer version, Asset Suite 9. ABB filed evidence on this matter which was rebutted by BC Hydro. This will be reviewed following an examination of BC Hydro's assessment of an upgraded version of Asset Suite 8 and the SAP alternatives.

BC Hydro states that it evaluated SAP and Passport solutions based on their ability to support the implementation of the Supply Chain Business Model and relied on the following criteria: Common Platform Strategy alignment, project cost, risk, and monetized benefits.

BC Hydro's overall evaluation and the evaluation of its ability to support the Supply Chain Business Model is summarized in Table 5. [65]

[62] Ibid., p. 3-3.
[63] Exhibit B-3, BCUC IR 1.4, 8.2, 8.3.
[64] Exhibit B-1, pp. 3-3 – 3-4.
[65] BC Hydro Final Submission, p. 42. – revised from version in Exhibit B-1, pp.3-4 - 3-5. Note that the Passport score for Ability to support the implementation of the Supply Chain Business Model has been increased to 37 from 36 for reasons BC Hydro sets out in Exhibit B-7-2, BCOAPO IR 2.28.1

Table 5 – Summary of Alternative Analysis Results

Criteria	Measure	Alternative 1 - (SAP)	Alternative 2 – (PassPort)
Ability to support the implementation of the SC Business Model	Degree to which capability gaps are closed by the alternative, with all capability gaps weighted equally. Scored out of 52	50	37[141]
Alignment with BC Hydro Common Platform Strategy	Binary (Yes / No)	Yes	No
Risk	Risk assessment rating relative to baseline	Baseline	Higher Business and Delivery Risk
Project cost	Cash flow ($ millions)	60 to 79	37 to 115
Monetized benefits[142]	Cash flow savings at stabilization ($ million/year).[143]	16 to 31	11 to 22
	NPV of discounted cash flows ($ millions)	2 to 103	(47) to 69
	NPV of revenue requirements impact ($ millions)	(7.8) to 86	(42.5) to 63

BC Hydro points out that SAP scores much higher with respect to its ability to close the capability gaps with SAP scoring 50 out of a possible 52 and PassPort scoring 37 (revised score). In addition, SAP aligns with BC Hydro's Common Platform Strategy and in its view maintains the baseline risk. By contrast, PassPort does not align with the Common Platform Strategy and is assessed to have higher business risk. In addition, the two alternatives are judged by BC Hydro to have project costs that are reasonably comparable, but that SAP will deliver greater financial benefits to the organization.[66]

BC Hydro states it "was well positioned to assess the current capabilities of the PassPort supply chain, and the ability of Passport and SAP to fill capability gaps, given BC Hydro's current experience with operating both PassPort and SAP." In addition, it explains that the gap assessment was undertaken by a team of individuals with first-hand knowledge and experience in either managing, implementing or sustaining SAP and PassPort within BC Hydro or at companies around the world. These individuals each had 10 to 20 years' experience.[67]

To assess the capability gaps between the two systems, BC Hydro developed a scoring range from zero to four with zero being applied when the system does not address the gap and a score of four assigned when the capability gap is fully addressed. Scores of one to three were awarded based on BC Hydro's assessment of the degree to which a particular gap was addressed in those cases where a gap was not fully addressed. BC Hydro also assessed each capability gap with reference to how dependent it was on being integrated with other business processes and IT systems. It adjusted the capability score downwards where integration dependency was considered high or where the integration that could be reasonably developed would not wholly close the capability gap.[68]

The scores awarded to SAP and PassPort are summarized in Table 6 and total 50 for SAP and 37 for BC Hydro.[69]

[66] Exhibit B-1, pp. 3-4–3-5; BC Hydro Final Submission, pp. 41-42.
[67] Exhibit B-3, BCUC 1.11.1; Exhibit B-4, CEC 1.49.2,
[68] Exhibit B-3, BCUC 1.7.1; Exhibit B-7, BCOAPO 2.27.2.
[69] BC Hydro Final Submission, p. 45; Note: The PassPort column is incorrectly added and actually totals 37.

Table 6 – Assessments of Capability Gaps

Capability Gap	Alternative 1 (SAP)	Alternative 2 (PassPort)
1 - Inability to manage service-related spend	4	2
2 - Limited contract management	4	3
3 – Limited ability to manage inventory levels	4	4
4 - Limited ability to manage individual supplier performance	4	4
5 – Difficulty managing the supply chain for capital projects	4	0
6 - Lack of order, delivery and payment tracking	4	3
7 - Inability to support sales and returns of unused materials	4	3
8 - Inability to support pre-packaging of materials for field crews	4	4
9 - Lack of wireless access to inventory information	4	4
10 - No self-serve option for routine service requests	4	3
11 - Inability to pay suppliers without an invoice	4	2
12 - Inability to streamline controls and approvals process	3	2
13 - Inability to integrate the work management systems	3	3
Total Score (out of 52)	**50**	**36**

While both systems scored well (four) on a number of capability gaps, there were numerous instances where the awarded scores decidedly favoured SAP. Among these are the following:

1. **Inability to manage service related spend** – The SAP system allows for all services, including those that are variable to be defined as manageable work units. PassPort has some of this capability but not for those like construction services that are variable. In addition, PassPort lacked a service catalogue and does not have separate processes for procurement of materials and services. This lack of capability and BC Hydro's high dependence on integration led to the reduced score of two for PassPort.[70]
2. **Limited contract management –** BC Hydro points out that with SAP there is more real-time contract information available and allowing services and materials to be requisitioned in one process gives SAP a decided advantage in contract management.[71]
3. **Difficulty managing the supply chain for capital projects-** BC Hydro states that by its nature integration is key to this capability. BC Hydro considers this a critical shortcoming of the PassPort's capabilities and reports that it has previously investigated the potential to integrate its current systems with PassPort and determined that it is not feasible. This led to Passport scoring zero on this capability.[72]
4. **Lack of order, delivery and payment tracking-** This capability speaks to the need for a single system end-to-end process from order to payment. PassPort was given a score of 3 because not all of the information from other systems can be interfaced back to PassPort and unlike SAP would not allow payments to occur under one system.[73]
5. **Inability to pay suppliers without an invoice-** Initially, BC Hydro gave PassPort a score of one, stating that it does not have Evaluated Receipt Settlement (ERS) capability, but acknowledged it could be

[70] Exhibit B-1, p. 46; Exhibit B-6-2, BCUC 47.1.2.
[71] Ibid., p. 3-9.
[72] Ibid., p. 3-10.
[73] Ibid., p. 3-10.

custom developed. After considering ABB's evidence BC Hydro concluded that PassPort could pay for materials but not contracts without an invoice. BC hydro raised the score to two because of this.[74]

6. **Inability to support sales and returns of unused materials –** BC Hydro gave PassPort a score of three pointing out that although returns processing in PassPort could be improved, it does not have a sales and distribution module which is a requirement to support these activities.[75]
7. **No self-serve option for routine service requests –** PassPort's limited services catalogue capabilities resulted in it being scored a three.[76]
8. **Inability to streamline controls and approval processes –** Neither SAP nor PassPort scored a four on addressing this capability. For SAP a reduction to a three reflected the work that must remain in PassPort as Work Management and Asset Management have not been undertaken. Passport was given a two reflecting the assertion that "much of the work will never be managed in PassPort and there is no Human Resources module in PassPort to support the use of organizational roles to determine approval authority."[77]

Cost of alternatives

BC Hydro prepared an AACE International Class 3 cost estimate for the SAP alternative based on quotes obtained through procurement processes for a systems integrator and a quality assurance provider combined with their own estimates for BC Hydro project resources. The mid-range estimate, including capital and operating, is $65.9 million (with a range $60.5 million to $70.3 million) as detailed in Section 3.5 of this Decision.[78]

In the absence of having a PassPort-specific conceptual design, BC Hydro states that it "used the detailed SAP Definition Phase cost estimate as a base from which it developed a cost range for the PassPort alternative for this evaluation."[79]

BC Hydro explains that it employed the following methodology in establishing a cost estimate for PassPort.

> For each cost component, BC Hydro estimated the level of effort (as a percentage) reasonable for a PassPort-based solution relative to the SAP based solution. Overall, the level of effort to complete the implementation of PassPort is estimated to be lower given that the existing supply chain system is PassPort-based. BC Hydro then multiplied the level of effort percentage by the SAP project cost estimate for each project activity and summed each cost to calculate a base cost for PassPort. BC Hydro then applied a contingency of 20 per cent on the cost estimate and added IDC to calculate a mid-range cost estimate. As no conceptual design exists for the PassPort alternative and consistent with BC Hydro standards, an uncertainty range of + 100% / 35% was applied to calculate the upper and lower bounds for the estimate."

This resulted in the cost estimate for PassPort outlined in Table 7:[80]

[74] BC Hydro Final Submission, p. 58.
[75] Exhibit B-1, p. 3-11.
[76] Ibid., p. 3-11.
[77] Ibid., p. 3-12.
[78] Ibid., pp. 2-12 – 2-19.
[79] Ibid., p. 3-15.
[80] Ibid., p. 3-16.

Table 7 – PassPort Cost Estimate

Phase / Activity	Capital Costs	Operating Costs	Total
Identification		1.2	1.2
Definition	17.3	1.9	19.2
Implementation	22.9	2.5	25.4
Contingency (20% x Definition & Implementation)	8.0	0.9	8.9
Total Cost (ex IDC)	48.2	6.5	54.7
Interest During Construction (IDC)	2.5		2.5
Total Expected Cost	**50.7**	**6.5**	**57.2**
Total Upper Bound Estimate (+100%)	**101.6**	**13.2**	**114.8**
Total Lower Bound Estimate (-35%)	**33.0**	**4.3**	**37.3**

BC Hydro states that the cost range is much larger for PassPort due to the uncertainty related to the methodology, the lack of a conceptual design and lack of a competitive bid process. It acknowledges that because of this it is difficult to draw a conclusion based on the cost estimate alone.[81]

To estimate the dollar value of savings for PassPort, BC Hydro relied on the benefit analysis conducted for the SAP benefits as a reference. Specifically, BC Hydro divided the PassPort score by the SAP score on each capability and multiplied this by its SAP monetized benefit estimates for each of these capabilities. The results of this analysis are outlined in Table 8, which shows the recurring monetized benefits range at stabilization for SAP is higher by $5 and $9 million per year. [82]

Table 8 – Annual Recurring Benefits Range at Stabilization (F2017 dollars)

Alternative	Annual Benefits Range ($ million)
1 – SAP	16.6 to 33.2
2 – PassPort	11.8 to 23.7

BC Hydro developed NPV analyses for PassPort using the same logic and general inputs as the NPV analyses undertaken for the SAP alternative. The results of these analyses are outlined in Table 9.

Table 9 – NPV Ranges for Alternative 1 and 2

Scenarios	NPV ($ millions)	
	DCF	Revenue Requirement
Alternative 1 (SAP)	2 to 103	(8) to 86
Alternative 2 (PassPort)	(47) to 69	(43) to 63

This table shows that BC Hydro estimates the NPV value range for discounted cash flows and revenue requirement impacts of SAP to be superior to that of Passport. Based on its analysis BC Hydro concludes that SAP is the superior alternative. In addition to a superior NPV it better supports the Supply Chain Business Model,

[81] Ibid., pp. 3-16–3-17.
[82] BC Hydro Final Submission, p. 69.

it aligns with the technology platform whereas PassPort does not, has lower business and technology risk and is expected to deliver greater financial benefits.[83]

Should BC Hydro have considered an upgraded Passport system?

ABB filed evidence in support of the notion that "an upgrade of Asset Suite is a far more cost-effective means of capturing the benefits of eliminating or reducing the impacts of the 13 identified gaps". ABB states that the 13 identified gaps are not true gaps related to Asset Suite but rather, are issues derived from ineffective or incomplete use of the current software. As a result, it contends that BC Hydro's scoring of PassPort in its analysis is not accurate and "if BC Hydro bases its cost/benefit analysis on erroneous gaps, then there is a high likelihood of less benefit and more cost than anticipated in replacing Asset Suite with the SAP system."[84]

In its evidence ABB presents its response to BC Hydro's comments on each of the identified gaps between the two systems. ABB does not specifically state that it is responding to these gaps on the basis of BC Hydro upgrading to the newer Asset Management 9 application. However, based on its responses to BCUC Confidential IRs 2.0 and 1.3.1[85] where it states that [redacted] this does appear to be the case. In summarizing its gap analysis responses, ABB noted that BC Hydro's internal project team neither consulted ABB nor had an understanding of the Asset Suite capabilities. As a result, any scores or calculations "do not reflect true value, benefits and costs". ABB also provided comments on BC Hydro's risk analysis and the cost of alternatives. It stated that it disagreed with BC Hydro's assessment that there was greater business, technology and project delivery risk. With respect to the cost of alternatives, ABB states that BC Hydro's assumptions are simply incorrect pointing out that the utility made no attempt to determine actual costs and based its costs on estimates of benefits that were not based on accurate assessment results. ABB did not provide a full estimate of what it believes the costs would be, noting that it is worth exploring whether an Asset Suite upgrade can close the capability gaps identified.[86]

BC Hydro states that an upgrade to Asset Suite 9 is not advisable and outlines four reasons why this is the case:

1. An upgrade to Asset Suite 9 is a much greater scope than the SCA project as it would involve an upgrade to its work management and asset management functions as well as business processes in addition to the supply chain. Moreover, there are currently customizations made to the existing PassPort program and it is not known how Asset Suite 9 would work with them. BC Hydro notes that it has already reduced risk by putting off projects like work management and asset management. Going ahead with these applications as required with Asset Suite 9 would not be prudent.
2. The increase in scope resulting from a major upgrade to Asset Suite 9 would result in increased risk due to the required business changes. In addition, it would involve changes to the end-user interface and the backend technical codebase.
3. Regardless of the PassPort version chosen, BC Hydro's supply chain business requirements will not be met as well as with SAP.
4. With regard to how it manages services and integrates with project management, SAP's supply chain model is more fulsome than that of Asset Suite.

BC Hydro concludes by stating that its reasons are compelling and undermine much of ABB's critique of the utility's analysis.[87]

[83] Exhibit B-1, pp. 3-18 – 3-19.
[84] Exhibit C3-3, p. 2.
[85] Exhibit C3-5-1.
[86] Exhibit C3-3, pp. 2-15.
[87] Exhibit B-11, pp. 2-5; BC Hydro Final Submission, pp. 39-40.

Intervener submissions

CEC considers BC Hydro's Alternatives Assessment to be inadequate, reliant on BC Hydro judgement and lacking appropriate cost comparisons and adequate cost benefit cost comparisons for each. CEC submits that "the Alternatives Analysis is not adequately justified to support an approval of the project at this time."[88] CEC's specific submissions with respect to BC Hydro's alternatives analysis include the following:

- The outcome of the comparison may be effectively predetermined since SAP is BC Hydro's common technology platform;
- CEC refers to ABB's assertion that costs can be driven up by having a common platform comprised of modules in various states. CEC believes this risk should be assessed in a business case evaluation by the Commission. CEC submits that breaking down the common platform into smaller segments like the current application could have the effect of limiting Commission oversight of the larger picture. This could lead to projects not being justified on the basis of their merits or a business case but rather being pre-established and justified using judgement-based analysis designed to conform with use of the platform;
- SAP was consulted during the development of the conceptual design and this had the potential to shape the project into an SAP-specific project;
- The inability to draw a specific conclusion based on project cost alone. This is important given SAP's pre-established role, BC Hydro's extensive use of judgement in its benefits analysis and its inclusion of 50% of soft benefits;
- BC Hydro neither sought nor received input from ABB regarding PassPort's ability to meet capability gaps; and
- BC Hydro did not compare SAP or PassPort's most recent technology offerings. CEC is of the view that BC Hydro should have developed an understanding of potential adjustments to the current system and the upgraded version as well as the SAP S/4 Hana solution.[89]

BCOAPO supports BC Hydro's decision to limit the systems considered to PassPort and SAP pointing out there is no evidence to suggest there is another, more superior IT system. BCOAPO also supports BC Hydro's decision to limit the choices of software and related hardware to those applications that it uses and notes that it shares the utility's concern as to risks associated with being an early adopter. It agrees that there are advantages to waiting until an IT product has matured and the bugs are worked out.[90]

However, BCOAPO does raise some concern regarding cost. While agreeing that "it is difficult to draw a specific conclusion as to which alternative is preferable based on project cost alone," BCOAPO states it is reasonable to conclude the PassPort alternative would have a lower cost. It bases this on the fact that PassPort is the current supply chain application and BC Hydro has stated it proposes only a moderate amount of customization.[91]

BCOAPO also raises a concern with respect to BC Hydro's familiarity with Asset Suite 8 and notes that it is particularly concerned over those features that are not being currently used. BCOAPO explains this concern is based on a number of factors including:

[88] CEC Final Submission, pp. 21-23.
[89] Ibid., pp. 19-22.
[90] BCOAPO Final Submission, pp. 4-7.
[91] Ibid., p. 12.

- The limited investment in PassPort since 2008;
- Nobody from PassPort was contracted to assist with its assessment;
- BC Hydro acknowledges that it has limited in-house PassPort technical knowledge; and
- In response to BCOAPO IR 2.28.2 BC Hydro has acknowledged the need to revise its initial assessment of PassPort being able to address capability gaps.

In spite of these concerns, BCOAPO notes that it accepts "BC Hydro's overall assessment that SAP better addresses the current capability gaps in its supply chain IT systems than Passport…."[92]

ABB made no specific submissions to BC Hydro's Final Submissions stating that its "motivation…was both to correct misinformation about perceived gaps between Asset Suite and SAP, and to support BC Hydro going forward to achieve its business objectives." ABB stated it wanted to provide insight and clarify that many of the identified gaps can be closed or diminished by better leveraging the current or upgrading to a subsequent version of Asset Suite.[93]

BC Hydro reply submission

BC Hydro states that the SCA Project stands on its own merits and its ability to meet BC Hydro's business needs is supported by the Company's business assessment.[94]

BC Hydro takes issue with CEC's reliance on ABB's comment that a common platform with modules in various states can drive up the cost of the technology and the project as well as future support and upgrade costs noting that it is counterintuitive and there is no evidence in support of this. Contrary to this position BC Hydro submits that it confirmed in rebuttal evidence that its SAP platform is up to date and fully integrated. It continues by reiterating the benefits of a common platform strategy highlighting items such as the reduction in overall complexity, more streamlined business processes and cost reductions for future business and technology changes.

BC Hydro submits that the alternatives assessment is unaffected by BC Hydro's consultation with SAP for the Conceptual Design Report. It states that it has relied on internal resources and contractors to assess the ability of SAP and PassPort to meet the capability gaps, independent from either ABB or SAP.[95] BC Hydro reiterates its evidence as to the experience of the resources it used to conduct the assessment.

With regard to CEC's concern with the lack of a definitive conclusion based on costs alone, BC Hydro explains that this is due to a wider accuracy range for the PassPort alternative. BC Hydro continues by noting that cost is only one factor in the alternatives analysis and the SCA Project is value-driven and the cost-benefit analysis as a whole favours an SAP solution.[96]

With regard to concerns that recent product offerings are not being considered, BC Hydro states that neither version of ABB Asset Suite meets BC Hydro's supply chain business requirements as well as SAP. BC Hydro notes it stated in its rebuttal evidence that the Asset Suite products are primarily an Enterprise Asset Management product, that focus on the maintenance of plant assets and its supply chain functionality primarily focuses on this. In addition, BC Hydro's rebuttal evidence states that "Asset Suite is a leading Enterprise Asset Management product for power generation utilities, it is not a leading product for transmission and distribution or a leading

[92] Ibid., pp. 9–10.
[93] ABB Final Submission.p. 1.
[94] BC Hydro Reply Submission, p. 26.
[95] Ibid., p. 28.
[96] Ibid., p. 30.

supply chain product." BC Hydro also notes that its views of PassPort (Asset Suite) and SAP are confirmed by multiple third-party expert reports.[97]

With respect to upgrading to Asset Suite 9 or SAP's S/4 HANA, BC Hydro states that CEC's submission that BC Hydro should consider being an early adopter is contradictory to its position that the utility should justify the project based on identified business needs. BC Hydro states that an implementation of either of these solutions would be a much "broader undertaking than the SCA project." In support of this, BC Hydro references its answer to BCUC IR 1.7.2 where it stated that there were few cases where either Asset Suite 9 or SAP's newer system had been implemented in major utilities. BC Hydro also stated in this IR that it did not consider it prudent to become an early adopter due to the technical risk of such a major upgrade. Further, BC Hydro sees no requirement for either Asset Suite 9 or S/4 HANA to meet its identified supply chain business requirements. [98]

BC Hydro addresses BCOAPO's concerns with respect to cost by stating that its cost estimate for the PassPort alternative "already reflects BC Hydro's estimation that the level of effort to implement PassPort would be lower, given that the existing supply chain system is PassPort based."

Concerning BCOAPO's comments regarding the utility's expertise with PassPort, BC Hydro argues to the contrary stating that it did not rely on SAP assistance. It restates its evidence that it used five evaluators each with 10 to 20 years' experience with either PassPort or SAP at BC Hydro and elsewhere. Two of these evaluators had 15 years' experience working with PassPort and SAP and combined have implemented or sustained these two systems at more than 50 businesses around the world. It explains that its reference to a more limited technical knowledge and capacity was not related to the assessment of capabilities but rather the ability to implement a PassPort solution in comparison to a SAP solution.[99]

Panel analysis and findings

The Panel finds that the work BC Hydro has done to identify and evaluate alternative supply chain applications is reasonable and the selection of SAP (ECC6/Ehp8) is justified.

In reaching this finding the Panel considered a number of issues:

- Whether PassPort and SAP were the most appropriate alternatives;
- Whether upgraded versions of either Passport (Asset Suite 9) or SAP (S/4 HANA) should be considered; and
- The grading of PassPort and SAP SCA solutions with respect to capabilities and cost.

BC Hydro outlined its reasons as to why it is appropriate to focus its attention on two alternatives; assessing the relative merits of upgrading the PassPort application currently in place and the SAP supply chain application as opposed to exploring the potential for another third-party solution. The Panel agrees. PassPort is the system currently in use and there are implicit advantages in terms of staff familiarity dictating that it should be considered. With respect to SAP, the evidence shows that this solution is considered "best of breed" in third-party studies, and because SAP is BC Hydro's common technology platform, it also offers advantages with respect to staff familiarity and more importantly, it allows for ease of integration. Moreover, a conceptual design was completed for the SAP alternative that confirmed it is a good fit. Based on this assessment BC Hydro determined that it was highly unlikely that other third-party IT systems could provide a material advantage over either of these potential solutions. The Panel agrees with this and accepts there would likely be additional costs related to a third-party solution given the additional hardware and licensing requirements. Further, based on the number of people from BC Hydro who rely on and use the system, the Panel accepts there would be

[97] Ibid., pp. 30–31.
[98] Ibid., p.31.
[99] Ibid., pp. 32–34.

additional challenges related to training and familiarity requirements with a brand new third-party system. Finally, the Panel notes there was no evidence presented that suggests a solution other than Passport or SAP would have material advantages over either of these applications.

A second related issue is whether BC Hydro should have considered the most recent versions of PassPort or SAP in determining the most appropriate alternative. Much of ABB's evidence focused on the additional capability an upgrade to its current Passport system would offer BC Hydro with regard to dealing with capability gaps. As stated, the Panel interprets ABB's evidence on the PassPort system capability to apply primarily to an upgrade to Asset Suite 9. BC Hydro has argued that upgrading to Asset Suite 9 is not advisable. The Panel agrees. BC Hydro has explained that it is not a simple matter of upgrading the system but instead would involve further upgrades to its work management and asset management function and related business processes. This would create additional risk and disruption and undo BC Hydro's risk mitigation measures, as both of these projects were put off for the time being in order to reduce potential risks. The Panel accepts that this, along with the fact that moving to Asset Suite 9 would involve changes to its end-user interface and backend technical codebase, poses significant challenges that are avoided with an implementation of the SAP solution. Moreover, the Panel notes that BC Hydro's statement, that SAP better meets its business requirements regardless of the Passport version chosen, was unchallenged by ABB as was the assertion that Passport is not a leading product for transmission and distribution utilities. Therefore, the Panel concludes that SAP is the best choice from the perspective of capability and risk reduction.

With respect to cost, BC Hydro has stated that given the uncertainty of costs related to PassPort it is difficult to draw conclusions. This is based on the fact that the cost estimate for Passport was not detailed and lacked the rigor of the work done for SAP. ABB was critical of BC Hydro's estimates. But in response to BCUC IR 2.2 to ABB concerning ABB's claim of cost effectiveness, ABB provided only estimates of its own costs stating that BC Hydro's costs "would need to be added for a total cost analysis."[100] BC Hydro notes that ABB's estimates are incomplete and unreliable, pointing out that its costs are the largest part of the project and outlining some of the additional costs that it would undertake as a result of moving ahead with Asset Suite 9.[101] The Panel agrees and finds that no conclusion can be drawn from ABB's assertion that it is more cost effective.

More generally, CEC considers the alternatives analysis conducted by BC Hydro to be inadequate pointing out that the outcome of the comparison between PassPort and SAP was effectively predetermined due to there being a common technology platform. As the Panel understands it, the move to a Common Platform does not preclude the use of alternative system applications but does offer numerous benefits not the least of which is the capability to integrate with other systems more readily. The Panel accepts that this may have provided an advantage to SAP but is not persuaded that BC Hydro's final decision was predetermined.

Given the volume of data provided by BC Hydro with respect to the challenges and risks of upgrading to Asset Suite 9 or the latest SAP version, the Panel finds that BC Hydro's decision to eliminate these systems from consideration to be prudent.

With respect to the evaluation process, questions were raised as to whether BC Hydro had the expertise to conduct an evaluation of PassPort. BC Hydro responded by providing a summary of the experience levels of the evaluation team with both the PassPort and SAP systems. Based on these submissions, the Panel finds the experience level of the evaluation team to be significant and demonstrates a broad knowledge and experience with both systems and therefore, should be capable of performing the evaluation.

Concerning the evaluation itself, the Panel notes there were considerable differences with respect to the analysis and scoring for SAP and PassPort concerning their ability to close the 13 capability gaps. BC Hydro's results strongly favoured the SAP solution over PassPort by a margin of 50 to 37 out of a possible total of 52

[100] Exhibit 3-5-1, BCUC IR 2.2.
[101] Exhibit B-11, pp.5–6.

points. This was based on a comparison of an upgraded existing PassPort system with the Proposed SAP solution. As noted, much of ABB's evidence related to improved ability to fill capability gaps was contingent on BC Hydro upgrading its system to Asset Suite 9, its recommended solution. As discussed, BC Hydro has rejected this option and the Panel has agreed. With respect to an upgraded Passport Asset Suite 8 system, the Panel finds there was insufficient evidence put forward supporting the ability to match the expected performance of SAP with respect to filling the capability gaps. Therefore, the Panel accepts BC Hydro's assertion and finds that the proposed SAP system will demonstrate superior performance with respect to the filling of capability gaps.

With respect to cost, BC Hydro acknowledges that its range of $33 million to $101 million with an expected cost of $50.7 million is much wider for PassPort due to various uncertainties and, as a result, it is difficult to draw a conclusion based on cost estimates alone. The Panel agrees and notes that a conceptual design was not completed, nor were quotes obtained for third party integration services for the PassPort option. However, given the evaluation scores and the time requirements and costs related to a further examination of an upgrade, the Panel is not persuaded there is much to gain by pursuing a further examination of a PassPort Asset Suite 8 upgrade.

3.3 Project benefits and financial impacts

As discussed in some detail in Section 3.1, BC Hydro has identified 13 capability gaps with its current supply chain management system and has outlined the impact of these gaps on the organization and its employees. Within its Application, BC Hydro has also laid out its expectations as to the benefits which will flow from the implementation of its proposed SAP solution. The issue the Panel must consider is the likelihood of these benefits being achieved and whether the calculation of estimates related to the quantum of benefits is reasonable given the work completed to date on the SCA Project.

Through its analysis BC Hydro has identified 64 discrete benefits that are expected to be realized through implementation of the project and, where practical, has assigned a monetary value to them. A spreadsheet listing these benefits was included in the Application which also included the following information:[102]

- Classification of the benefit as either effort, cost or risk reduction;
- Impact to the business of the identified problem;
- Potential benefit to the business of addressing the problem;
- Methodology for determining the magnitude of each benefit; and
- Quantification of the benefit expressed in hours or dollars.

Benefits are described as either reducing costs, effort or risk. To be conservative, and in recognition that soft benefits are difficult to quantify, BC Hydro has assumed for its base case that 50 percent of the identified potential monetary value of the benefits will be achieved. To allow for further sensitivity analysis, BC Hydro has developed two additional scenarios for estimating the annual benefit cash flows; the high scenario at 60 percent of estimated potential monetary value and the low scenario at 30 percent. Given that BC Hydro has employed a bottom-up approach to estimating benefits it considers there to be a high likelihood that 50 percent or more of the benefits will be realized.[103]

In performing its analysis BC Hydro has relied on the following assumptions:

- For cost reduction benefits, 76 percent are related to capital activities while 24 percent are related to operating activities. This is based on historical data. For effort reduction benefits, 40 percent are attributed to capital activities with the remaining 60 percent related to operating activities; and

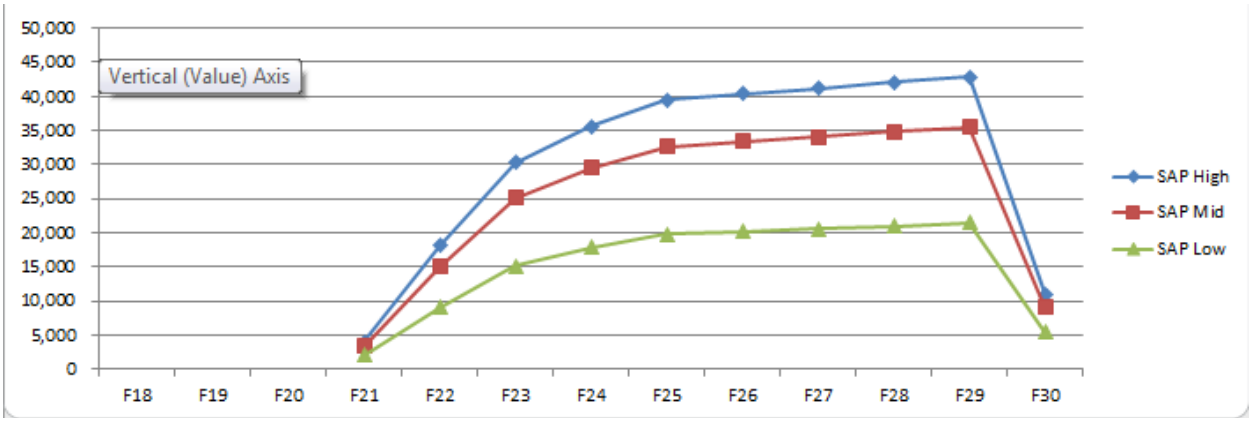
[102] Exhibit B-1, Attachment F, Workbook Tab 1; Updated in response to BCUC IR 39.1.
[103] Ibid., pp. 2-25–2-27; Exhibit B-6, BCUC IR 33.4.

- Given the need for time for the system to stabilize and proficiency requirements to realize the value of the benefits, any cost or reduced-effort benefits will not begin until one year after the project has gone into service. Following this, effort benefits ramp up over a two-year period. BC Hydro points out that cost reduction benefits are tied to the creation of more favourable contract terms which are in turn dependent upon historical cost and usage data not currently readily available. The data in the new supply chain system will be used to leverage future contract negotiations as contracts expire. Therefore, over a four-year period following stabilization, cost reduction benefits are estimated to ramp up linearly.[104]

BC Hydro estimates the monetary value of the benefits for cost reduction savings will range between $7.3 million and $15.7 million per year with effort reduction savings between $9.3 million and $18.5 million per year in 2016 dollars. The larger part of the effort reduction savings reflect the reduction or redeployment of staff, with cost reductions coming from material or services. BC Hydro states that it expects there will be some FTE reduction as well as savings related to redeployment in other activities and these will be spread across multiple employees and multiple departments. Based on this, the NPV of the benefits on a cash-flow basis for the base case is $68.3 million, $2.2 million for the low scenario and $103.2 million for the high scenario.[105]

A summary of the benefit savings by scenario by year is listed in Figure 2. This shows the monetary value of combined cost and effort reduction savings on a cash flow basis with a July 2019 (fiscal 2020) start date. By fiscal 2025 all of the benefits have been estimated to be stabilized and are forecast to increase by inflation thereafter. BC Hydro has calculated cash and effort cash flow benefits for a period representing the 10-year asset accounting life although it expects the IT system will be in place for a period beyond this.[106]

Figure 2 – SAP Benefit Cash Flow by Fiscal Year



With regard to benefits which were not monetized, BC Hydro explains that during its benefits analysis a number of risks that could be reduced or eliminated as a result of closing the capability gaps were identified. These include safety, financial, reputational and reliability risks. However, while expected to result in reduced or avoided costs, there is insufficient information to calculate an economic benefit. Nonetheless, while unable to express these in monetary terms, BC Hydro asserts the following qualitative benefits related to these categories:

- Having improved information on vendors and their qualifications will result in better vendor decisions and reduce the likelihood of a safety issue from moderate to low;

[104] Ibid., pp. 2-25–2-27; Exhibit B-7, CEC IR 76.1.
[105] Ibid., Attachment F, Tab F1 - Benefits List.
[106] Ibid., pp. 2-27–2-28.

- Having a limited ability to accurately report on where its money is spent and with who is a reputational risk. Implementation of SCA will result in the likelihood of occurrence of this moderate risk being reduced to low; and
- The utility currently has limited ability to systematically associate single or multiple material quality inspections or track quality inspections in an automated fashion. Implementation of SCA will result in reducing the likelihood of occurrence from moderate to low to moderate.

BC Hydro states that during the Definition Phase the project team will continue to design the Supply Chain Applications system and will update and refine the benefits analysis for inclusion with its Phase Two verification report.[107]

In BCUC IR 33.2, Commission staff raised the issue of the application of BC Hydro's Capital Investment Analysis Guide (Guide), which states that "economic benefit(s) provided by the project will be characterized as 'hard' or 'soft' depending on the level of certainty associated with achieving the benefits and whether it directly impacts BC Hydro's costs and/or revenues" According to the Guide, hard benefits are to be included in NPV calculations at 100 percent of their estimated value and soft benefits at no more than 25 percent. Although BC Hydro agrees that the majority of benefits could be categorized as soft, it argues that the recommended 25 percent is not appropriate for the SCA Project given the level of definition. The project team raised this to 50 percent because the level of analysis undertaken would result in an underestimation of benefits. BC Hydro explains the Guide is not used in the business justification of individual projects, but is one of the inputs to decision making when prioritizing investments for BC Hydro. As such, the Guide "aims to ensure uniformity in assessing the impact of undertaking a risk or value driven project to support the prioritization of capital investments across BC Hydro". A large proportion of such projects are prioritized with the project's deliverables being minimally defined with varying levels of certainty regarding benefits or costs.[108]

BC Hydro states that as the SCA Project has progressed into the Early Definition Phase it has matured allowing for bottom-up benefit development and a reduction in uncertainty. It believes the 50 percent estimate of benefits is conservative and appropriate for NPV analysis at this time. The 25 percent soft benefit inclusion rate stated in the Guide results from a qualitative comparison of sample project value scores with no quantitative analysis undertaken and is a guideline for the purpose of prioritization. Once a project's deliverables are better defined, the project team or steering committee is responsible for determining the appropriate benefit inclusion rate.[109]

BC Hydro acknowledges the NPV of cash flows for the mid-benefit-mid-range cost estimate drops significantly to $6.5 million with a 25 percent inclusion rate.[110]

Intervener submissions

BCOAPO asserts that BC Hydro's characterization of the benefit realization rate of 50 percent as conservative is far from conservative, and instead considers this percentage of benefit realization to be realistic. BCOAPO argues it is unreasonable to assume the transition to the new system will be so effective as to result in 100 percent benefit realization, nor is it realistic to assume that 100 percent of the employee reduction estimate will result in staff savings in dollars.[111]

CEC submits that BC Hydro's reliance on the use of judgements and assumptions and their significance and relevance to the benefits assessment may result in false granularity of the data. CEC provides numerous

[107] Ibid., p. 2-29.
[108] Exhibit B-6, BCUC IR 33.2.
[109] Exhibit B-6, BCUC IR 33.5.
[110] Ibid., BCUC IR 33.2.
[111] BCOAPO Final Submission, p. 15.

examples where BC Hydro's professional judgement or estimates of those working with the material has been relied upon to arrive at the quantum of benefit. While recognizing Hydro's efforts to produce its estimates, CEC raises concern with the evidence in terms of its certainty and implied level of granularity and submits it has been inadequately analysed and measured. It is CEC's submission that it is possible the savings will not go to ratepayers as many of the benefits are uncertain.[112]

CEC also takes issue with BC Hydro's estimates of FTE savings with specific reference to BC Hydro's admission that some FTE's will be reduced and some diverted to other activities with no detailed workforce plan. CEC acknowledges that BC Hydro's projected FTE savings may exist but submits there is significant uncertainty concerning whether these benefits will be realized.[113]

In addition, CEC raises concern with the reliance on a 50 percent benefit inclusion rate when a 25 percent rate is specified in the Capital Investment Analysis Guide noting that under the 25 percent prescribed in the Guide, the NPV for the mid-range estimate drops to $6.5 million. CEC points out that BC Hydro's explanation that "given the analysis undertaken, the 25 percent guideline will unreasonably underestimate the benefits" is based on judgement and has no evidentiary basis. Moreover, BC Hydro's bottom-up approach to benefit assessment provides "no greater security for an assessment of soft benefits than would otherwise be available". CEC continues by stating that the Guide provides a considered rationale for the 25 percent inclusion rate for "soft" benefits. Further, in addition to applying this rate to prioritization as outlined by BC Hydro, CEC considers it reasonable to apply it to business justification especially in those cases where there is no clear means of estimating the soft benefits.

CEC submits that an NPV of $6.5 million (at 25 percent) on a cost of $66 million is unjustified unless supported by more and better analysis.[114]

With respect to risk reduction benefits, CEC takes a similar position. In CEC's view the benefits are uncertain, lack evidentiary support and fail to provide significant project justification. In making this assessment, CEC points to BC Hydro's acknowledgement in answer to BCUC 1.2.1 that its risk assessment involves significant judgement and the Commission should not infer any outcome from the content of the table provided in that response.[115]

BC Hydro reply submission

In response to BCOAPO's employee savings concerns, BC Hydro states that it expects to reduce some FTE's and will divert others to alternate activities based on operational requirements resulting in either cost reductions or as an offset to cost increases. It reports that it has already eliminated 28 full-time positions as part of the implementation of the Supply Chain Business Model noting that it has temporarily backfilled some of these positions with contract labour in the interim period.[116]

BC Hydro responds to CEC's submission on the use of judgement and assumptions resulting in false granularity of data and a significant level of uncertainty as follows:

- Specific project benefits have been identified and broken down to specific tasks that could be automated with the new system. This speaks to the level of granularity and detail at which project benefits were calculated.
- Actual quantified values are used in the benefit calculations. BC Hydro presented a number of examples of factors in its benefit calculations that are actual quantified values and made up part of their calculations.

[112] CEC Final Submission, pp. 10–11.
[113] Ibid., p. 12.
[114] Ibid., pp. 13–14.
[115] Ibid., p. 15.
[116] BC Hydro Reply Submission, p. 24; Exhibit B-6, BCUC IR 30.13.

- Benefits are based on realistic targets. An example of this is the projected inventory turnover estimate of 2.5. This was based on information regarding BC Hydro's peer group which indicated an inventory turnover ratio of 2.79 percent.
- Reliance on professional judgement is sensible in those cases where the time and effort from improved systems and process cannot be quantified. BC Hydro argues that those individuals who are actually performing the tasks are in the best position to estimate time savings from automation.
- Uncertainty of relying upon judgement has been taken into account through the application percentages for achievement of benefits in its benefit estimates.[117]

BC Hydro submits that use of the 25 percent benefit inclusion rate from its Guide, as argued by CEC, would represent a misapplication and inappropriate use of the guideline. BC Hydro reiterates that the guideline is for the purpose of investment prioritization and as project deliverables become better defined "it is up to the project team and/or steering committee to determine what the appropriate benefit inclusion rate should be for economic evaluation and/or future capital investment prioritization purposes." BC Hydro argues that the 25 percent level is not appropriate for this project given the current mature level of definition of the project's deliverables and again maintains that the 50 percent benefit inclusion rate proposed is itself a conservative estimate of the benefits.

BC Hydro also disagrees with CEC's comments regarding risk reduction benefits. BC Hydro's position is that the benefits are intuitive despite the inherent challenges in quantifying them. BC Hydro believes it has identified the risks and the impact of the SCA Project on reducing them and argues this should be given weight in the Commission's assessment of public interest.[118]

Panel analysis and findings

While the SCA project is still in the Early Definition Phase, the Panel finds that the work BC Hydro has done to identify and quantify the value of benefits resulting from the implementation of the project is reasonable. CEC has stated that more and better analysis of the potential benefits is required, which is in keeping with its overall recommendation of having the Commission deny the Application until BC Hydro makes improvements.[119] The Panel disagrees. In our view the SCA project is well beyond the identification stage and a significant amount of work has been done to examine the benefits and calculate their monetary value. While the project is in the early part of the Definition Phase, BC Hydro has acknowledged the project team will continue to update and refine its benefit calculations. The Panel is satisfied sufficient work on the identification, analysis and valuation of benefits has been completed to justify continuing to move forward to completing the definition process.

BC Hydro has identified 13 capability gaps and has analysed these to determine their impact on the organization. This has provided guidance as to systems requirements and potential benefits that can be realized through making desired improvements. BC Hydro has examined each of these in detail to determine and quantify the benefits in terms of reduced costs to current operations and reduced effort creating an opportunity to reduce or reallocate staff to other requirements. As BC Hydro has stated, this bottom-up approach to its examination of benefits has allowed for a calculation of the monetary value of benefits based on actual quantified values, which in the view of the Panel increases the credibility of the outputs. In addition, the Panel notes that BC Hydro has taken steps to guard against being overly optimistic with its projections by discounting the monetary value of the benefits. The Panel considers the 30 to 60 percent range for scenarios reasonable and BC Hydro's approach prudent as it is designed to reduce concern that the utility is over-stating its ability to deliver. In addition, the Panel notes that all of the scenarios developed result in a positive NPV on cash flows providing additional comfort.

[117] BC Hydro Reply Submission, pp. 16-17; Exhibit B-6, BCUC IR 35.2.
[118] BC Hydro Reply Submission, pp. 18–20.
[119] CEC Final Submission, p. 23.

CEC has expressed concern with BC Hydro's reliance on the use of employee judgements and assessments in determining its benefit assessments. While such methods of benefit calculation are not ideal, the Panel accepts that where time and effort cannot be accurately quantified, it is reasonable to rely on the estimates of those involved with performing the tasks to understand the impact of automation of these processes. Moreover, the Panel points out that the reliance on a 50 percent discount rate for the monetary valuation of benefits mitigates some of the risk with reliance on these estimates and therefore finds the approach taken by BC Hydro to be reasonable given the circumstances.

CEC disagrees with BC Hydro's submission that the reliance on a 50 percent benefit inclusion rate is not in keeping with direction provided by the utility's Guide which prescribes a maximum of 25 percent benefit inclusion rate when soft benefits are concerned. The Panel accepts BC Hydro's explanation that this would result in the Guide being misapplied. In our view BC Hydro has conducted substantive bottom-up planning and review of potential benefits and capturing a benefit value substantially greater than one in four dollars is reasonable and a 50 percent rate is justified.

CEC also takes issue with BC Hydro's risk reduction benefits stating that they are uncertain and lack evidentiary support. BC Hydro responds by stating that the benefits are intuitive and should be given weight. The Panel notes that BC Hydro has not attempted to quantify in monetary terms these benefits and they have no direct impact on the financial justification. The Panel considers this approach conservative but can be justified due to the nature of the benefits and the difficulty in estimating their impact in monetary terms. Nonetheless the Panel finds that the risk reduction benefits do deserve limited weight due to their potential to positively affect risks related to vender selection, the ability to better report on expenditure detail and an enhancement of inspection data available.

With regard to BC Hydro's assertion that the 50 percent benefit valuation is conservative, the Panel disagrees. We agree with BCOAPO that this is a realistic estimate for this stage of the project, taking into account the fact that IT implementations rarely go exactly according to plan and the nature of benefit estimates is such that applying a rate higher than the proposed 50 percent would not be prudent.

3.4 Project risks and risk mitigation measures

BC Hydro submits that the SCA Project has an overall moderate project risk as a result of actions that have been undertaken prior to the project which have reduced overall project risk. These actions are described as follows:

- Ensuring that integration with other BC Hydro systems is adequately considered. BC Hydro submits that its work on the Transformation Blueprint has "advanced its understanding" of the project design requirements and how the supply chain interacts with other systems further than BC Hydro would otherwise have been at this stage of the project had the Transformation Blueprint not been undertaken;
- Managing the extent and speed of change introduced at BC Hydro. BC Hydro submits that the decision in 2013 not to implement the Transformation Blueprint IT Projects as a single program, reduced the current risk of implementing a new supply chain IT system, because of a reduced risk of experiencing a major disruption to BC Hydro's operations;
- Developing the Supply Chain Business Model and Supply Chain Business Requirements in 2012 clarified what BC Hydro requires of its supply chain; and
- Implementing the Supply Chain Solutions – SAP project in 2014 proved that BC Hydro can expand the use of SAP to include meeting BC Hydro's requirements for purchasing, issuing and storing inventory with minimal customization of the SAP platform and that it can successfully create the necessary interfaces with PassPort.[120]

[120] Exhibit B-1, pp. 4-29 – 4-31; Exhibit B-3, BCUC IR 6.8.

In addition, BC Hydro provided a risk register for identified SCA Project risks, a description of the major risks and the mitigation activities it has developed or is currently planning. The risk register outlines the status of those mitigation plans, and its expectations, at this stage of the project, of the probability and consequences of each risk. BC Hydro also provided the Risk Management Plan that it has in place to manage these risks.

The risks of the SCA Project are grouped into four categories:

- Business risks related to the realization of benefits that are dependent upon the adoption of change;
- Technology risks related to the maturity of the technology;
- Project delivery risks related to the delivery of the project; and
- Readiness risks related to the ability of the organization to execute the project.

BC Hydro identified two key risk events within each risk category relating to business, technology and readiness risks, and eleven key risk events or threats related to project delivery risks. [121]

BC Hydro submits that the System Integrator will have primary responsibility for the day-to-day coordination and execution of activities on the project, "including identifying and monitoring risks and developing risk mitigation plans." BC Hydro submits that this model provides "the best opportunity to reduce project risk by leveraging the experience, methodology and teamwork of a System Integrator."[122] Furthermore, BC Hydro submits that the System Integrator shares in the project risk as it has provided a fixed price bid for the project.[123] The Master Services Agreement between BC Hydro and the System Integrator reflects "BC Hydro's preference for certainty and risk mitigation" because of a number of risk sharing provisions that are included in the agreement.[124]

BC Hydro expects that the project risks will be reduced through the course of the Definition Phase as its mitigation plans are advanced.

Intervener submissions

CEC states that one of the reasons it doesn't agree that BC Hydro has provided an adequate case for approval of the SCA Project is because the SCA Project risk register will not be refreshed until BC Hydro receives approval to proceed with Definition Phase activities.[125]

BCOAPO submits "[a]part from the need to recognize the additional project delivery risk arising from the need to deactivate the current PassPort system, [it] has no major issues with BC Hydro's assessment" of the risks of the SCA Project.[126]

BC Hydro reply submission

BC Hydro responds to CEC in its reply submission stating that the status of the SCA Project risk register "is not a reason to deny the Application." BC Hydro submits that the risk register of the SCA Project demonstrates that it is "prudently planning to mitigate project risks" and argues that its decision not to update the risk register while

[121] Exhibit B-1, pp. 4-29 – 4-38; Exhibit B-3, BCUC IR 30.7; The eleven project delivery risks includes the risk associated with the deactivation of PassPort, which BC Hydro acknowledged in response to BCOAPO IR 27.4 that it considered, and should have listed, as a delivery risk when discussing the risks of the SAP alternative.
[122] Exhibit B-3, BCUC IR 30.7.
[123] Exhibit B-3, BCUC IR 30.6.
[124] Exhibit B-3, BCUC IR 30.9.
[125] CEC Final Submission, p. 1.
[126] BCOAPO Final Submission, p. 19.

the project is on hold for review by the Commission is reasonable. BC Hydro reiterates that the risk register is a "living" document which will be continually refreshed.[127]

Panel discussion

The Panel is satisfied the approach to project risk management employed by BC Hydro is appropriate. BC Hydro has determined the known risks and quantified them in terms of likelihood of occurrence and consequence and has appointed a qualified System Integrator to manage those risks.

The Panel agrees with BC Hydro that it was a reasonable course of action not to update the risk register pending Commission approval of Phase 1 of the Application and the execution of the Master Services Agreement between BC Hydro and the System Integrator. The current risk register assigns responsibly for each risk to internal resources. BC Hydro noted that it intends to update the risk register once this Decision is complete and it has approval to proceed with Definition Phase activities, including onboarding the System Integrator.[128]

3.5 Project costs

BC Hydro estimates the total cost of the project will be between $60.5 million and $79.3 million based on a committed in-service date of July 2019, and an estimated capital cost of $54.3 million to $71.8 million.[129] At the time of the Application, $11.8 million of the total estimated cost has been incurred, including $7.3 million pertaining to "Supply Chain Transformation Blueprint" costs. BC Hydro submits that a portion of previously incurred costs from an existing "integrated preliminary design" for a supply chain IT project and four other IT projects on an SAP platform (called the "Transformation Blueprint") includes early design work related to BC Hydro's supply chain. Therefore, BC Hydro determined a fair value of $7.3 million for the Supply Chain Transformation Blueprint work and considers it appropriate to transfer this value to the SCA Project.[130]

In this proceeding, BC Hydro requests acceptance of capital expenditures of $22.2 million to $29.7 million to complete work up to the end of the Definition Phase of the project. The estimated total cost of the project up to the end of the Definition Phase is projected to be $24.7 million to $32.4 million.[131] BC Hydro stated it is not seeking acceptance of any operating costs in this Application (nor will it seek acceptance of operating costs in Phase Two of the proceeding) but has presented all costs related to the project because the operating cost portion of the project is relevant to the Commission's determinations.[132]

Mid-range cost estimate

A mid-range cost estimate of $65.9 million represents BC Hydro's mid-level expectation of the total cost of the project. BC Hydro explains that this amount includes a 20 percent project contingency equal to $8.5 million on total estimated future direct costs of the project and "represents costs that BC Hydro expects to expend but that are not detailed in the base estimate of direct project costs."[133] The 20 percent contingency was derived based on "the professional opinion of the project management team, and is consistent with the cost contingency used on projects at BC Hydro."[134]

BC Hydro states that the mid-range cost estimate has an AACE International Class 3 cost estimate accuracy range of + 15 percent/- 10 percent, and that "the +15 percent upper accuracy range is analogous to a P90 estimate (i.e.

[127] BC Hydro Reply Submission, p. 23.
[128] Exhibit B-3, BCUC IR 30.7.
[129] Exhibit B-1, p. 2-12; Section 1.1.2, p. 1-6; Section 2.4.5, p. 2-21, Table 2-7.
[130] Exhibit B-3, BCUC IR 16.1; Exhibit B-1, p. 4-7.
[131] Exhibit B-1, Table 2-8, p. 2-23.
[132] Exhibit B-3, BCUC IR 31.1
[133] Exhibit B-1, pp. 2-13, 2-15; Exhibit B-3, BCUC IR 13.7.
[134] Exhibit B-3, BCUC IR 13.1.

the project cost should fall within this range 9 times out of 10)."[135] Although BC Hydro stated that it has "high confidence" that it can complete the SCA Project without exceeding the 15 percent upper accuracy range, it is unable to assign a specific probability to the likelihood of that occurring because it has not performed a Monte Carlo analysis. Instead it has based the cost value ranges on professional opinion.[136]

In support of its estimate, BC Hydro provided a breakdown of the mid-range cost estimate by project phase as shown in Table 10.[137]

Table 10 – Mid-range cost estimate breakdown

SAP Project - Mid-range cost Cost (000's)	Life to date	Future estimate (inflated)	Total	%
Early Design Work (Transformation WIP)				
IOMA	$ -	$ -	$ -	0%
Capital[1]	$ 7,310	$ -	$ 7,310	100%
Interest during construction	$ -	$ -	$ -	0%
Sub-total	$ 7,310	$ -	$ 7,310	100%
Identification				
IOMA	$ 1,236	$ -	$ 1,236	100%
Capital	$ -	$ -	$ -	0%
Interest during construction	$ -	$ -	$ -	0%
Sub-total	$ 1,236	$ -	$ 1,236	100%
Early Definition				
IOMA	$ 115	$ 252	$ 367	8%
Capital	$ 3,012	$ 968	$ 3,980	84%
Interest during construction	$ 83	$ 296	$ 379	8%
Sub-total	$ 3,210	$ 1,516	$ 4,726	100%
Mobilization & Design				
IOMA	$ -	$ 783	$ 783	7%
Capital	$ -	$ 9,379	$ 9,379	89%
Interest during construction	$ -	$ 414	$ 414	4%
Sub-total	$ -	$ 10,576	$ 10,576	100%
Implementation (pre go-live)				
IOMA	$ -	$ 2,178	$ 2,178	8%
Capital	$ -	$ 22,944	$ 22,944	84%
Interest during construction	$ -	$ 2,211	$ 2,211	8%
Sub-total	$ -	$ 27,333	$ 27,333	100%
Implementation (post go-live)				
IOMA	$ -	$ 1,240	$ 1,240	20%
Capital	$ -	$ 4,924	$ 4,924	80%
Interest during construction	$ -	$ -	$ -	0%
Sub-total	$ -	$ 6,164	$ 6,164	100%
Total before contingency	$ 11,756	$ 45,589	$ 57,345	
Contingency - 20% of future estimates	$ -	$ 8,534	$ 8,534	
Total after contingency	$ 11,756	$ 54,123	$ 65,879	

[1]Transformation blueprint value
[2]Source: Attachment F, Tab C2

BC Hydro submits that the mid-range capital cost estimate for work up to the end of the Definition Phase is $23.5 million, and the mid-range cost estimate including operating costs for work up to the end of the Definition Phase is $26.1 million.[138]

[135] Exhibit B-1, p. 2-15; p. 3-5; Exhibit B-6, BCUC IR 43.1.
[136] Exhibit B-1, p. 2-16, Footnote 17; Exhibit B-6, BCUC IR 43.1.
[137] Exhibit B-3, BCUC IR 16.1.
[138] Exhibit B-1, Table 2-8, p. 2-23.

Upper-bound cost estimate

BC Hydro explains its calculation of the upper-bound cost estimate of $79.5 million in section 2.4.2 of the Application. The upper-bound cost estimate is calculated as the sum of the mid-range cost estimate plus a "Project Reserve" with incremental interest during construction of $13.4 million. Table 11 shows the calculation of the upper-bound cost estimate.[139]

Table 11 – Upper Bound Cost Estimate

Ref	Cost Components	Capital Cost	Operating Costs	Total Cost
O	Mid-Range Cost Estimate (N from Table 2-2)	59.2	6.7	65.9
P	Project Reserve - Incremental contingency (15% of rows I & K from Table 2-2) for unknown risks	6.9	0.8	7.7
Q	Project Reserve - Reserve for known risks (W from Table 2-4)	5.2	-	5.2
R	Incremental Interest During Construction on Project Reserve	0.5	-	0.5
S	Total Project Reserve (P + Q + R)	12.6	0.8	13.4
T	Upper Bound Cost Estimate (O + S)	71.8	7.5	79.3

As outlined in Table 11, the Project Reserve is comprised of three elements: i) an incremental contingency of $7.7 million to mitigate known risks; ii) an additional reserve amount of $5.2 million to mitigate cost impacts associated with "known risks [which] have not been assigned a probability of occurrence but may be realized by the project;" and iii) the incremental interest during construction arising from the cost of items i and ii.

Within the $5.2 million, BC Hydro identifies two known risks which are related to extended regulatory processes impacting the project schedule, and one known risk related to the potential proposed offshore development work to be unfeasible. In responses to information requests, BC Hydro explains that each of the two known risks related to extended regulatory processes are coincident with the proposed timing of SCA Project Phase One and Phase Two approvals from the Commission. The costs are based on the assumption that, should the risks materialize, it would take four months to complete each of the additional regulatory processes; thereby, moving the target and committed in-service dates of the proposed project schedule by that corresponding number of months. BC Hydro estimates that the cost impact of a delay in obtaining the Commission's Phase One and Phase Two approvals are $0.6 million and $3.6 million, respectively. The cost impact of a delay at the end of the Definition phase is "more significant" as BC Hydro will have mobilized a larger project team onsite at that point, including significant System Integrator resources, and it also considers mobilization and demobilization costs during a delay.[140] In the event BC Hydro determines development work cannot be performed offshore in the Definition phase, the added Implementation phase cost of performing all development work onshore is estimated to be $1 million.[141]

As discussed in Section 3.4 of the Decision, BC Hydro provided a copy of the risk register and Risk Management Plan for the SCA Project further explaining the likelihood of occurrence and the impact of the known risks. BC Hydro submits it is "unlikely" (i.e. there is a 10 percent chance) the Commission's Phase One approval will take longer than planned but this would have moderate impact; however, it is "almost certain" (i.e. there is 75 percent chance) the start of the Implementation phase will be delayed due to delay in Phase Two approval and this would also have a moderate impact on project cost. BC Hydro submits it is "likely" (i.e. there is a 50 percent chance) that the SCA Project may not be able to utilize offshore development as planned, but this would have a minor cost impact.[142]

[139] Ibid., Table 2-3, p. 2-17.
[140] Ibid., Table 2-4, p. 2-18; Exhibit B-3, BCUC IR 13.4; BCUC IR 30.7, Attachment 1.
[141] Exhibit B-1, Table 2-4, pp. 2-18, 4-36; Exhibit B-7-1, CEC IR 85.1.
[142] Exhibit B-3, BCUC IR 30.7, Attachments 1, 2.

The upper-bound capital cost estimate requested in this Application for work up to the end of the Definition phase is $29.7 million. This amount includes $1.9 million out of the total incremental contingency of $7.7 million for costs up to the end of the Definition Phase, and $4.2 million out of the total additional reserve amount of $5.2 million for the two extended regulatory processes. The upper-bound cost estimate including operating costs for work up to the end of the Definition Phase is $32.4 million.[143]

Lower-bound cost estimate

The lower-bound cost estimate of $60.5 million is calculated by reducing the estimated future direct costs of the project and the project contingency, each by 10 percent (i.e. the lower end of the cost estimate accuracy range). Table 12 below shows each of the components of the calculation:[144]

Table 12 – Lower-Bound Cost Estimate

Ref	Cost Components	Capital Cost	Operating Costs	Total Cost
X	Mid-Range Cost Estimate (N from Table 2-2)	59.2	6.7	65.9
Y	Lower Bound adjustment (-10% of rows I & K from Table 2-2)	(4.6)	(0.5)	(5.1)
Z	Lower Bound Interest During Construction adjustment	(0.3)		(0.3)
AA	Lower Bound Total adjustment (Y + Z)	(4.9)	(0.5)	(5.4)
AB	Lower Bound Amount (X + AA)	54.3	6.2	60.5

Of this amount, the lower-bound capital cost estimate for work up to the end of the Definition Phase as applied for is $22.2 million. When operating costs are added this increases to $24.7 million.[145]

Intervener submissions

CEC submits that the project costs are uncertain being "established in the early definition phase" and relies on professional judgment. In its view, reliance on a "professional opinion approach" to a cost estimate "undermines the validity of the cost estimate." Accordingly, CEC recommend that the Commission deny the current application and require BC Hydro improve, among other things, its cost analysis as the "cost analysis alone does not support a clear preference for the SAP solution."[146] Furthermore, CEC submits it would be appropriate for BC Hydro to "provide full context for any anticipated [SAP platform] upgrades in a more fully developed business case."[147]

BCOAPO has no issues with the accuracy of BC Hydro's project cost estimate, but submits that the Commission should "require BC Hydro to re-do its benefit analyses so as to recognize (as part of the cost of [the] project) an appropriate portion of the future SAP platform upgrade costs."[148]

BC Hydro reply submission

BC Hydro disagrees with CEC and submits that its cost estimate is robust and its estimating approach makes sense for a number of reasons, including:

[143] Exhibit B-1, Table 2-8, p. 2-23.
[144] Ibid., Table 2-5, pp. 2-18 – 2-19.
[145] Exhibit B-1, Table 2-8, p. 2-23.
[146] CEC Final Submission, pp. 1-2, 7.
[147] Ibid., p. 8.
[148] BCOAPO Final Submission, pp. 11, 16.

- The Identification Phase and Early Definition Phase costs up to the end of the November 2016 are actual recorded costs;
- The remaining Definition and Implementation phase costs have been forecast using a bottom-up approach based on pricing and proposal information submitted by the Systems Integrator and Quality Assurance Advisor;
- A significant portion of the direct costs are subject to fixed-price contracts with the Systems Integrator and Quality Assurance Advisor;
- BC Hydro has not incorporated any potential cost savings from the gain-sharing provision in the Master Service Agreement with the Systems Integrator. If any cost savings due to the gain sharing provision occurs, this would reduce the project cost;
- Interest during construction is calculated based on the committed in-service date rather than the earlier target date, which is conservative since it leads to higher interest costs ($770,000) being reflected in the project cost estimate;
- The cost estimate includes a 20 percent contingency calculated on the costs still to be incurred and represents costs that BC Hydro expects to expend. The 20 percent contingency is consistent with the cost contingency used on other BC Hydro projects; and
- The upper-bound costs estimate incorporates a project reserve, with incremental interest during construction.[149]

BC Hydro disagrees with BCOAPO that it would be appropriate to include future upgrade costs of the SAP platform in the cost of the SCA Project for the following reasons:

- The SAP platform upgrade is not necessary to meet the SCA Project objectives.
- The decision to do a future SAP platform upgrade is independent of BC Hydro's decision to use SAP for supply chain.
- A SAP platform upgrade cannot be performed for individual modules – it involves the entire platform. Accordingly, the costs of a SAP platform upgrade should also be separately accounted for.
- It is premature to consider since BC Hydro does not consider it prudent to become an early adopter of the SAP S/4 HANA product.[150]

Panel analysis and findings

The Panel finds the proposed lower-bound and mid-range cost estimates of the SCA Project, in total and up to the end of the Definition Phase are supported by their respective cost breakdowns and are reasonably robust given the current stage of the project. The Panel notes that BC Hydro has assigned the mid-range cost estimate to be an AACE International Class 3 estimate, which is used for CPCN's. While not providing certainty, this cost estimate provides the Panel a level of comfort.

The Panel agrees with BC Hydro with respect to the inclusion of a portion of SAP upgrade costs as part of the benefit analysis. Since the cost of the upgrade must be borne regardless of whether the SCA project is, or is not approved, the Panel finds charging costs to this project is unreasonable.

The Panel is also concerned that the upper bound cost estimate for capital costs up to the end of the Definition Phase of $29.7 million is overstated with respect to the additional reserve amount. Our understanding is that $3.6 million of the additional reserve amount relates to the regulatory process associated with the Commission's review of a Phase Two verification report. Accordingly, the Panel's view is that the request for this reserve would

[149] BC Hydro Reply Submission, pp. 10-12.
[150] Ibid., p. 13; Exhibit B-3, BCUC IR 29.4; Exhibit B-6, BCUC IRs 42.1, 42.2, 42.2.1

have been more appropriately included in BC Hydro's request for acceptance of Phase Two capital expenditures. Notwithstanding, the Panel is prepared to accept that $29.7 million is the upper bound capital cost estimate for work through to the end of the Definition Phase and the start of the Implementation phase. However, if there is no delay in the start of the project Implementation phase we expect that the balance of the $3.6 million reserve will remain unspent. In the event that any amount of this reserve is spent, BC Hydro must provide appropriate explanations for the reasons why to the Commission.

The Panel takes no issue with the calculation of the incremental contingency up to the end of the Definition Phase and the principle of calculating additional incremental interest during construction on any amounts included in a Project Reserve.

3.6 Commission determination

Subject to and in accordance with the findings, approvals and determinations in this Decision and pursuant to section 44.2(3)(a) of the *UCA,* the Panel finds the capital expenditures in the amount of $22.2 million to $29.7 million required to complete work up to the end of the Definitions Phase of the SCA project as described in BC Hydro's Application are in the public interest and accepts them.

As discussed in Sections 3.1 to 3.3, BC Hydro has provided sufficient justification of the need for the project, has reasonably examined the alternatives and has completed sufficient work on the identification, analysis and valuation of project benefits to justify moving forward to complete the Definition Phase. In addition, BC Hydro has outlined within a range the costs it expects will be required to complete the Definition Phase, as well as the total project.

Due to the nature of this Application the Panel has previously determined that a two-phase approach to its review was warranted. This has led to a separation of the definition cost process which is specifically addressed in this determination, and the costs to implement the project which will be addressed at a later date. BC Hydro has proposed providing a verification report with updates on costs, benefits, scope and schedule information to initiate Phase Two of this project. The Panel accepts this and addresses the form of the verification report and the filing requirements in detail in Section 4.0.

4.0 Phase Two requirements

At the end of the Definition Phase BC Hydro proposes the following occur:

- The filing of a verification report updating the cost, benefits, scope, and schedule information of the SCA Project based on the completed Definition Phase work; and
- The Commission issue a Phase Two order accepting capital expenditures of the Implementation Phase as being in the public interest with minimal regulatory process if the cost, benefits, scope and schedule assumptions do not materially change compared to what was reviewed in the Phase One proceeding.[151]

BC Hydro proposes a material change be defined as follows:

[151] Exhibit B-1, p. 1-18.

1. Cost changes where the upper range of the revised cost estimate exceeds the upper range of the cost estimate in this Application;
2. Benefit changes where the lower range of the revised benefits estimate is lower than the lower end of the benefit range in this Application;
3. Scope changes such that the project no longer address one of the 13 capability gaps identified in section 2.3 of the Application, or meets the Supply Chain Business Requirements described in section 4.2.6 of the Application; and
4. Schedule changes resulting in a delay of more than the four months included in the calculation of SCA Project schedule contingency.[152]

Intervener submissions

BCOAPO was supportive of a Phase Two regulatory process, agreeing that a Phase Two review should be able to "proceed expeditiously subject to a satisfactory verification report". However, BCOAPO suggested the following additional steps:

a) The Commission direct BC Hydro to prepare a compliance filing that sets out the SCA Project's current cost and benefits estimates incorporating the revisions noted in BC Hydro's responses to IRs, as well as any adjustments required by the Commission's in its Phase One Decision;

b) BC Hydro be required to host a brief workshop to present the results of its Phase Two verification report and answer clarifying questions from parties; and

c) The Commission convene a procedural conference after the workshop, requesting input from parties as to whether material changes to the SCA Project have occurred.[153]

CEC makes no comment on the form and content of a Phase Two regulatory process. However, CEC noted that BC Hydro's definition of a material change "would not include the situation in which the Upper Bound [c]ost [e]stimate and Low Benefits scenario materialized."[154]

BC Hydro reply submission

In response to BCOAPO's suggestions, BC Hydro submits that the proposed process is sufficient, but it is "content to proceed with the additional process" if the Commission concludes that it would assist in the effective disposition of Phase Two.[155]

4.1 Commission determination

If there is no material change in the costs, benefits, scope or schedule of the SCA Project, as defined in section 1.3.2.2 of the Application, BC Hydro proposes the project should proceed to the Implementation Phase with minimal regulatory process. The Panel finds that accepting this proposal undermines the very logic of allowing for a two-stage process. As described in section 3.9 of the Decision, the Panel accepts capital expenditures up to the end of the Definition Phase of $22.5 to $29.7 million as being in the public interest. We are not accepting capital expenditures for the entire project as being in the public interest. In order to do so, the Panel finds there may be a requirement for a more comprehensive review at the end of the Definition Phase.

[152] Exhibit B-1, pp. 1-18 – 1-19.
[153] BCOAPO Final Submission, pp. 21-22.
[154] CEC Final Submission, p. 3.
[155] BC Hydro Final Submission, p. 4; BCOAPO Final Submission, p. 22.

While the Panel agrees that a review of the Definition Phase activities and planned Implementation Phase should address the four criteria proposed by BC Hydro, it is not prepared to accept those criteria as the only criteria to be considered in the Phase Two review. In particular, the Panel notes in addition to the proposed verification report, that BC Hydro has advised that it intends to generate or update a number of reports and tools during the course of the Definition Phase as part of the preliminary design process. For example, as discussed in section 3.4 of the Decision, BC Hydro has developed a risk register for the SCA Project which BC Hydro and the System Integrator will "review, update and monitor the risk register throughout the project lifecycle."[156] In addition, BC Hydro noted in response to information requests that the Quality Assurance Advisor will be asked to deliver a number of reports, including a "Project Gate Report" called the "Design Review Report" at the end of the Definition Phase. In that report, BC Hydro states:

> …the Quality Assurance Advisor will review the completeness of the deliverables in the Definition Phase. The Design Review Report will make observations as to whether to proceed into the Implementation [p]hase along with other supporting recommendations.[157]

Finally, BC Hydro states that it will file an initial set of "baselines, metrics and measures in the [Phase Two] verification report" as it relates to SCA Project benefit realization plans.[158]

Therefore, the Panel directs BC Hydro to file a Phase Two verification report (Verification Report) at the end of the SCA Project Definition Phase which includes the following information.

A. Cost Update Report

The Cost Update Report must include:

i) Actual costs incurred to the end of the Definition Phase compared to the mid-range project cost estimate provided in Table 2-8 of the Application and in BC Hydro's response to BCUC IR 16.1, highlighting any significant variances or difficulties that the project encountered and the use of any project contingencies or reserves; and

ii) An updated project cost range summary and mid-range cost estimate in the same format as provided in Table 2-7 of the Application and in response to BCUC IR 16.1, highlighting the reasons for significant changes in future estimated project costs and with the project contingency broken down into reserves for known and unknown risks.

B. Benefits Update Report

The report must include an updated listing of the project benefits as provided in Attachment F, workbook tab F1, of the Application; updated benefits savings by year; and updated NPV of discounted cash flow and revenue requirements impacts. The Benefits Update Report must also provide an initial set of the baselines, metrics and measures pertaining to the project's benefit realization plans.

C. Scope Update Report

The report must identify and describe any material scope changes compared to the SCA Project scope described in section 4.3 of the Application.

D. Risk Update Report

The report must include:

i) A summary description of any material project risks that were not identified in the Application but were identified during the Definition Phase, including an assessment of the impact of each

[156] Exhibit B-3, BCUC IR 30.7.
[157] Exhibit B-4, BCOAPO IR 5.1.
[158] Exhibit B-6, BCUC IRs 51.3, 51.4.

risk, the proposed risk mitigation strategy, and to the extent known, the financial and schedule impacts if the risk is realized; and

ii) An updated project Risk Register as at the end of the Definition Phase, highlighting the status of identified risks, changes in risks, the actions that BC Hydro is taking or planning to deal with the risks, and the likely impact on the projects' schedule and cost.

E. Project Schedule Update Report

The report must provide an updated project schedule, identifying and detailing any significant changes (i.e. greater than 4 months) compared to the project schedule described in section 4.7 and Appendix M of the Application.

F. Quality Assurance Advisor Design Review Report

BC Hydro must provide a copy of the Quality Assurance Advisor's Design Review Report as described above.

Further process will be determined once the Commission receives the Verification Report.

DATED at the City of Vancouver, in the Province of British Columbia, this 19th day of October, 2017.

Original signed by:

D.A. COTE
PANEL CHAIR / COMMISSIONER

Original signed by:

M. KRESIVO, Q.C.
COMMISSIONER

Original signed by:

R.I. MASON
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G-158-17

IN THE MATTER OF
the *Utilities Commission Act*, RSBC 1996, Chapter 473

and

British Columbia Hydro and Power Authority
Supply Chain Applications Project Application

BEFORE:
D. A. Cote, Panel Chair/Commissioner
M. Kresivo, Q.C., Commissioner
R. I. Mason, Commissioner

on October 19, 2017

WHEREAS:

A. On December 21, 2016, British Columbia Hydro and Power Authority (BC Hydro) filed, pursuant to section 44.2(1)(b) of *the Utilities Commission Act* (UCA), a Supply Chain Applications Project application and related statement of capital expenditures with the British Columbia Utilities Commission (Commission), requesting acceptance of a portion of the capital expenditures pursuant to section 44.2(3)(a) of the UCA (Application);

B. BC Hydro proposed that the Supply Chain Applications Project be reviewed in a two-phase regulatory process, which in combination will lead to the acceptance of the estimated range of Supply Chain Applications Project capital costs as being in the public interest;

C. By Order G-4-17 dated January 13, 2017, the Commission established a regulatory timetable for the review of the Application, which included one round of information requests and a procedural conference with further process to be determined;

D. The following interveners registered in the proceeding:

- FortisBC Energy Inc. and FortisBC Inc. (collectively FortisBC);
- Commercial Energy Consumers of British Columbia (CEC);
- British Columbia Old Age Pensioners' Organization *et al*. (BCOAPO);
- ABB Enterprise Software (ABB); and
- Richard Landale;

E. The Procedural Conference was held on March 10, 2017 in Vancouver;

F. By Order G-32-17 dated March 15, 2017, and amended by Order G-53-17 and Order G-78-17 dated April 10, 2017 and May 18, 2017, respectively, the Commission established a regulatory timetable for the remainder of the proceeding, which included a second round of information requests, a process for ABB to submit intervener evidence, an option for BC Hydro to submit rebuttal evidence, and written final and reply

submissions. By Order G-32-17, the Commission also accepted that a two-phase regulatory process to review the Supply Chain Applications Project is appropriate;

G. The Commission has reviewed and considered the evidence and submissions and finds that the work required up to the end of the Definition phase of the SCA Project is in the public interest.

NOW THEREFORE the Commission orders as follows:

1. Pursuant to section 44.2(3)(a) of the UCA, capital expenditures ranging from $22.5 million to $29.7 million required to complete work up to the end of the Definition phase of the SCA project are accepted.

2. BC Hydro is directed to file as soon as practicable a Phase Two verification report at the end of the Definition phase of the SCA Project, the form of which is detailed in Section 4.0 of the decision issued with this order.

DATED at the City of Vancouver, in the Province of British Columbia, this 19th day of October 2017.

BY ORDER

Original signed by:

D. A. Cote
Commissioner

British Columbia Hydro and Power Authority
Supply Chain Application Project

LIST OF ACRONYMS

ABB	ABB Enterprise Software
Application	BC Hydro Supply Chain Application Project Application requesting acceptance of a portion of the capital expenditures up to the end of the Definition Phase of a Supply Chain Applications Project
BC Hydro or the Company	British Columbia Hydro and Power Authority
BCOAPO	British Columbia Old Age Pensioners' Organization *et al.*
CEC	Commercial Energy Consumers of British Columbia
Commission	British Columbia Utilities Commission
Components	Components included in the Transformation Initative: asset and resource planning; customer connections; work management; contractor strategy; and operations performance.
ERS	Evaluated Receipt Settlement
FBC	FortisBC Inc.
FEI	FortisBC Energy Inc.
FortisBC	FortisBC Energy Inc. and FortisBC Inc.
Guide	Capital Investment Analysis Guide
IRs	Information Requests
NPV	Net Present Value
Phase One	Definition Phase
Phase Two	Implementation Phase
Pre-Work	Identification Phase
Projects	Four IT projects identified by the Transformation Initative that dealt with: asset management; work management; scheudeling, dispatch and mobility; and customer connections
PwC	Pricewaterhouse Coopers
Report	*Review of BC Hydro*, dated June 2011

SCA	Supply Chain Application
Supply Chain Business Model	Supply Chain and Fleet Operations Business Model
Supply Chain Business Requirements	153 supply chain specific business requirements set out in the Supply Chain Business Model Report
Supply Chain Unit	The business units responsible for the supply chain reorganized into a centralized structure
UCA	The *Utilities Commission Act*

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EXHIBIT LIST

Exhibit No.	Description
COMMISSION DOCUMENTS	
A-1	Letter dated January 06, 2017 - Appointing the Panel for the review of BC Hydro Supply Chain Applications Project
A-2	Letter dated January 13, 2017 – Establishing Regulatory Timetable, Public Notice and Clarification of Procedural Conference
A-3	Letter dated February 6, 2017 – Commission Information Request No. 1 to BC Hydro
A-4	Letter dated March 3, 2017 – Procedural Conference Information
A-5	Letter dated March 15, 2017 – Commission Order G-32-17 with Reasons for Decision and Regulatory Timetable
A-6	Letter dated April 10, 2017 – Commission Order G-53-17 with Revised Regulatory Timetable
A-7	Letter dated April 20, 2017 – Commission Information Request No. 2 to BC Hydro
A-8	Letter dated April 20, 2017 – Commission Information Request No. 1 to ABB on Intervener Evidence
A-9	Letter dated May 16, 2017 – Commission Correspondence Regarding ABB's Confidentiality Request
A-10	Letter dated May 18, 2017 – Commission Correspondence with Revised Regulatory Timetable
A-11	Letter dated June 1, 2017 – Commission Correspondence Regarding Rebuttal Evidence Information Requests

APPLICANT DOCUMENTS

B-1	**BC HYDRO AND POWER AUTHORITY (BC HYDRO)** Letter dated December 21, 2016 - Supply Chain Applications Project Application
B-1-1	**CONFIDENTIAL** Letter dated December 21, 2016 - Confidential Supply Chain Applications Project Application
B-2	Letter dated February 16, 2017 – BC Hydro Submitting Notice of Application Published in News Publications
B-3	Letter dated March 2, 2017 – BC Hydro Submitting BCUC Information Responses No. 1
B-3-1	**CONFIDENTIAL** Letter dated March 2, 2017 – BC Hydro Submitting BCUC Confidential Information Responses No. 1
B-4	Letter dated March 2, 2017 – BC Hydro Submitting Intervener Information Responses No. 1
B-4-1	**CONFIDENTIAL** Letter dated March 2, 2017 – BC Hydro Submitting Intervener Confidential Information Responses No. 1
B-5	Letter dated April 20, 2017 – BC Hydro Submitting Information Request to ABB
B-6	Letter dated May 12, 2017 – BC Hydro Submitting Responses to BCUC Information Request No.2
B-6-1	**CONFIDENTIAL** Letter dated May 12, 2017 – BC Hydro Submitting Confidential Responses to BCUC Information Request No.2
B-6-2	Letter dated May 15, 2017 – BC Hydro Submitting Responses to BCUC Information Request No.2
B-7	Letter dated May 12, 2017 – BC Hydro Submitting Responses to Interveners Information Request No.2
B-7-1	**CONFIDENTIAL** Letter dated May 12, 2017 – BC Hydro Submitting Confidential Responses to Interveners Information Request No.2
B-7-2	Letter dated May 15, 2017 – BC Hydro Submitting Remaining Eight Responses to Interveners Information Request No.2
B-8	Letter dated May 17, 2017 – BC Hydro Submitting Confidentiality Declaration and Undertaking Forms
B-9	Letter dated May 17, 2017 – BC Hydro Submitting Notice of Intent to File Rebuttal Evidence
B-10	Letter dated May 24, 2017 – BC Hydro Submitting Confidentiality Declaration and Undertaking Form

B-11 Letter dated May 24, 2017 – BC Hydro Submitting Rebuttal Evidence to Intervener Evidence and responses to Information requests filed by ABB - Redacted

B-11-1 **CONFIDENTIAL** Letter dated May 24, 2017 – BC Hydro Submitting Confidential Rebuttal Evidence to Intervener Evidence and responses to Information requests filed by ABB

B-12 Letter dated June 14, 2017 - BC Hydro Submitting Response to Rebuttal Evidence IRs

INTERVENER DOCUMENTS

C1-1 **FORTISBC INC. AND FORTISBC ENERGY INC (FBC)** – Form dated January 27, 2017 Request to Intervene by Diane Roy

C2-1 **COMMERCIAL ENERGY CONSUMERS ASSOCIATION OF BRITISH COLUMBIA (CEC) –** Form dated January 26, 2017 Request to Intervene by David Craig and Christopher Weafer

C2-2 Letter dated February 10, 2017 – CEC Submitting Information Request No. 1 to BC Hydro

C2-3 Letter dated April 20, 2017 – CEC Submitting Information Request No. 2 to BC Hydro

C2-4 Letter dated April 20, 2017 – CEC Submitting Information Request to ABB

C2-5 Letter dated June 2, 2017 – CEC Submitting Information Request on BC Hydro Rebuttal Evidence

C3-1 **ABB ENTERPRISE SOFTWARE (ABB) –** Form dated January 27, 2017 Request to Intervene by Summer Trudell

C3-2 Letter dated February 10, 2017 – ABB Submitting Information Request No. 1 to BC Hydro

C3-3 Letter dated April 6, 2017 – ABB Submitting Rebuttal and additional information

C3-4 Letter dated May 12, 2017 – ABB Submitting Request for Extension

C3-5 Letter dated May 12, 2017 – ABB Submitting Responses to Intervener and BCUC Information requests – Redacted

C3-5-1 **CONFIDENTIAL** Letter dated May 12, 2017 – ABB Submitting Confidential Responses to Intervener and BCUC Information requests

C4-1 **BRITISH COLUMBIA OLD AGE PENSIONERS' ORGANIZATION, ACTIVE SUPPORT AGAINST POVERTY, COUNCIL OF SENIOR CITIZENS' ORGANIZATIONS OF BC, DISABILITY ALLIANCE BC, AND THE TENANT RESOURCE AND ADVISORY CENTRE, (BCOAPO ET AL.) –** Form dated January 27, 2017 Request to Intervene by Erin Pritchard & Tannis Braithwaite

C4-2 Letter dated February 10, 2017 – BCOAPO Submitting Information Request No. 1 to BC Hydro

C4-3	Letter dated April 20, 2017 – BCOAPO Submitting Information Request No. 2 to BC Hydro
C4-4	Letter dated April 20, 2017 – BCOAPO Submitting Information Request No. 2 to ABB
C4-5	Letter dated July 7, 2017 – BCOAPO Submitting Filing Extension Request
C5-1	**LANDALE, RICHARD (LANDALE) –** Form dated January 17, 2017 Request to Intervene by Richard Landale
C5-2	Letter dated February 10, 2017 – Landale Submitting Information Request No. 1 to BC Hydro
C5-3	Letter dated March 8, 2017 – Landale Submitting Comments regarding Procedural Conference
C5-4	Letter dated April 20, 2017 – Landale Information Request No. 2 to BC Hydro
C5-5	Letter dated April 20, 2017 – Landale Information Request No. 1 to ABB on Intervener Evidence
C5-6	Letter dated June 2, 2017 – Landale Submitting Comments regarding Information Request on BC Hydro Rebuttal Evidence