SFU Beedie & BC Hydro Business Analytics Hackathon 2025: Detailed Case Study

This case was prepared for classroom discussion and contains simplified/modified information. We gratefully acknowledge BC Hydro's support; any errors are our own. It is intended for experiential learning and may not be reproduced, stored, or transmitted without the authors' written permission.

1. Case Context

BC Hydro, a provincial Crown corporation, is entrusted with the vital responsibility of generating and delivering electricity to 95% of British Columbia's population—approximately five million people. The electricity it provides is fundamental to the province's economy, the daily lives of its citizens, and the overall quality of life in B.C. To fulfill this mandate, BC Hydro depends on a robust and intricate supply chain to source, manage, and deploy a wide array of essential equipment, materials, and components. This case study specifically focuses on the strategic challenges and inherent risks within this equipment and materials supply chain. This supply chain is the critical backbone that enables BC Hydro to:

- Ensure the continuous and reliable delivery of electrical service to its millions of customers.
- Maintain and upgrade its vast existing power infrastructure across the province.
- Successfully execute further capital projects aimed at expanding this infrastructure to meet B.C.'s growing power needs and support a sustainable energy future.

To manage the procurement of these vital goods and services, BC Hydro employs a category management approach for most of its expenditures. This strategic method organizes purchases into distinct groups, or 'categories'—such as "Distribution Switchgear," "Power Transformers," "Wire & Cable," and "Construction Equipment"—allowing for more effective and specialized management of its extensive procurement requirements.

The relationship BC Hydro has with its suppliers is paramount. These suppliers are not merely vendors of products and services; they are integral partners in ensuring the availability of the critical equipment and materials necessary for BC Hydro to achieve its mission and strategic priorities, particularly in infrastructure development and service continuity. Over the past decade, the company's collaboration with external suppliers has grown significantly, with annual spending on the goods and services they provide increasing by more than 300%, from $650 million to over $2 billion. This increased reliance on external partners for essential equipment and components underscores the critical importance of a resilient and efficient supply chain.

However, the global landscape in recent years has introduced heightened vulnerabilities to these crucial supply chains. Factors such as international trade tariffs, cross-border transportation delays, geopolitical instability, and pervasive economic uncertainty have created a challenging environment for sourcing and delivering necessary equipment and materials. Disruptions—including unexpected tariff increases on imported components, logistical bottlenecks affecting

equipment delivery, or failures of key equipment suppliers—can directly threaten BC Hydro's ability to maintain its infrastructure, deliver essential capital projects on schedule, and ultimately ensure uninterrupted service. The consequences can range from project delays and cost escalations to impacts on the reliability of the power grid itself if critical spares or new equipment are unavailable.

The BC Hydro 2025/26 – 2027/28 Service Plan explicitly acknowledges these threats to its equipment and project supply chains, stating, "geopolitical factors have caused negative disruptions to supply chains which are resulting in project delays and project cost escalations." The plan further highlights considerable uncertainty regarding potential U.S. tariffs and policy shifts, warning that such changes "will have significant implications for federal and provincial economies and to BC Hydro's load, revenue, trade, supply chains, and ability to deliver capital projects". This uncertainty makes it difficult to predict the full adverse impact on BC Hydro's operational performance, financial stability, and its fundamental ability to provide reliable service and build for the future. As an equipment-heavy utility, ensuring timely access to maintenance repair parts, critical spares, and materials for infrastructure expansion is paramount.

Given this context, the Supply Chain team at BC Hydro is tasked with developing practical insights and actionable recommendations to effectively manage and mitigate these evolving supply chain risks, particularly focusing on the flow of equipment and materials crucial for both continuous service and strategic infrastructure projects. Your role, as part of this initiative, is to leverage available data and research (including those listed below as well as other data and information you can find on your own) to identify specific product categories and broader equipment portfolios that are most vulnerable to disruptions. This analysis will form the foundation for strategic decision-making aimed at bolstering the resilience of BC Hydro's equipment supply chain, ensuring it can support the ongoing delivery of reliable power and the development of infrastructure for B.C.'s future.

2. Data Sets and Variables

Internal and external data set are provided in the hackathon. Internal data, sourced from BC Hydro, has been modified to ensure confidentiality. External data is gathered from publicly available sources.

BC Hydro – All Vendor Data.xlsx

This data set contains 3213 records of a broad class of verified vendors that includes both service and supply of inventory. Important fields in this data file are defined as follows:

- **Reference #:** A unique identifier for each vendor.
- **Category Name:** This is category name of the physical inventory or service purchased by BC Hydro. To understand these categories, please refer to the data file "**BC Hydro - Category Description – 2025.xlsx**". Category items fall within one of the following 5

portfolios: Major Equipment, Engineering and Technology Services, Material and Logistics, Field Support Services and Enterprise.

- **Vendor performance:** This is a newly developed metric for BC Hydro that classifies vendor performance into one of 3 ratings: Excellent, Good and Developing.

BC Hydro - Category Description.xlsx

To understand the relationship between "Portfolios" and product "Categories", please review this file. Category items (supply or services) fall within one of the following 5 portfolios: Major Equipment, Engineering and Technology Services, Material and Logistics, Field Support Services and Enterprise.

BC Hydro – SC risk tolerance by category.xlsx

This file shows the annual expenditures and the risk tolerance across both portfolio and product categories. To understand the column for "Risk tolerance of the category", please review the Canvas file "All about risk tolerance.pdf". Recall, they are defined as follows:

- **Low tolerance** - Stop Avoid taking the risk. If risk is operationally necessary or cannot be avoided (and approved work procedures are not available), escalate risk on urgent basis so that mitigation can be put in place to bring risk to a tolerable level before proceeding, with more permanent mitigation occurring in the medium and long term.
- **Moderate tolerance** - Proceed with caution. Conduct due diligence and establish the business case for taking the risk and seek approval. Put in place appropriate governance and measures to prevent risk consequences from occurring, as well as plans for managing any consequences that do occur.
- **High tolerance** - Go - Pursue innovation opportunities with the expectation that failure could occur when consequences are not material and can be easily contained by 'failing fast', learning from the experience, and moving on. Usual due diligence should be exercised following established governance protocols with a bias for action (trying new things) versus risk avoidance.

When it comes to the inventory management of product categories, risk tolerance is directly related. Some categories have no room for risk, such as stockouts, and other categories are more robust to such uncertainties.

BC Hydro - Vendor and Inventory Data.xlsx

This is a primary dataset containing information on a sample of BC Hydro's vendors and the equipment and materials they regularly order from their vendors. This data file is representative of vendor inventory. Each vendor's inventory must be managed effectively to prevent both stockouts and oversupply. Important fields in this data file are defined as follows:

- **Reference #:** A unique identifier for each vendor (the same as BC Hydro – All Vendor Data.xlsx)
- **Country of Origin:** The geographical country from which the item (equipment, material, component) is sourced and transported from.
- **Category NAME**: The specific group or classification to which an item belongs (e.g., "Switchgear," "Construction Equip," "Power Transformer").
- **Average Lead time (in days)**: The typical or average duration, measured in calendar days, from the point an order for an item is placed with a supplier to the point the item is delivered to BC Hydro. **Note:** Longer lead time items typically are larger equipment that requires product customization from suppliers (e.g., switchgears, power transformers, major generation powerhouse equipment, distribution transformers, etc).
- **Standard Deviation of Lead time (in days)**: as stated.
- **Frequency of use**: Represents the rate at which each item is typically consumed or utilized by BC Hydro (e.g., for maintenance, replacement, or new projects), expressed in units per month.
- **Safety stock**: The additional quantity of an item held in inventory to reduce the risk of stockout (i.e., not having the equipment when needed) due to uncertainties in supply (lead time variability) and/or demand for that item.
- **Active stock (unassigned)**: The current physical on-hand inventory of an item that is available for use (i.e., not already committed to a specific project or maintenance task).
- **Days of supply (current)**: An estimate of the number of days the current Active stock (unassigned) of an item will last, given its Frequency of use. This is a key indicator of immediate risk to equipment availability.
- **Reorder point (stock level)**: The inventory level for an item at which a replenishment order should be initiated to avoid running out of that equipment or material during its procurement lead time.

Part II – External data sources

WTO tariff data - HS Code specific.xlsx

This file is from the **WTO Tariff & Trade Data** platform, specifically from the **Analytical Database (ADB)**, and provides the **MFN Applied Duty**[1] **– Simple Average** which is average tariff rates applied by a country on its imports from other WTO members for the last 5 years (2020 to 2025). The data provided is based on **HS Codes** (Harmonized System) codes that is a global product classification system for trade data.

This file contains country and year specific of MFN Applied Duty rates for the following sample of category items that are important BC Hydro's supply chain. This directly reflects the current tariff costs BC Hydro would likely face when importing equipment from global vendors, assuming no preferential tariff rates apply from specific supplier countries. Understanding the actual duties being levied is crucial for budgeting, cost analysis, and assessing the immediate impact of global tariff changes.

Power Transformers: For large power transformers, which typically have high power handling capacities, the following 6-digit HS Codes are most relevant:

- **850422:** Liquid dielectric transformers, having a power handling capacity exceeding 650 kVA but not exceeding 10,000 kVA.
- **850423:** Liquid dielectric transformers, having a power handling capacity exceeding 10,000 kVA.
- **850433:** Other transformers, having a power handling capacity exceeding 16 kVA but not exceeding 500 kVA.
- **850434:** Other transformers, having a power handling capacity exceeding 500 kVA.

Switchgears: For large switchgears, which implies high voltage equipment used in power systems, the following 6-digit HS Codes are most relevant:

- **853720:** Boards, panels, consoles, desks, cabinets and other bases, equipped with two or more apparatus of heading 8535 or 8536, for electric control or the distribution of electricity, for a voltage exceeding 1,000 V. This is appropriate for assembled high-voltage switchgear units.
- **853590:** classifies electrical apparatus for switching or protecting electrical circuits, or for making connections to or in electrical circuits, for a voltage exceeding 1,000 volts, not specified elsewhere in heading 8535. This category includes items like lightning arresters, voltage limiters, surge suppressors, and other similar devices, but excludes things like fuses, automatic circuit breakers, isolating switches, and make-and-break switches.

[1] MFN Applied Duty rates refer to the actual customs duties a country currently charges on imports from other World Trade Organization (WTO) members under the **Most Favoured Nation** (MFN) principle.

- **850490:** Parts of items under heading 8504 (transformers, static converters, inductors) .

Generators for Powerhouses: For large generators for powerhouses are typically classified as "electric generating sets", the following 6-digit HS Codes are most relevant:

- **850213:** Generating sets with compression-ignition internal combustion piston engines (diesel or semi-diesel engines), of an output exceeding 375 kVA.
- **850164:** AC generators (alternators), of an output exceeding 750 kVA. This is further broken down by specific kVA ranges in national tariffs.

Battery Energy Storage Systems (BESS). BESS involves multiple components, but the batteries are central, the following 6-digit HS Codes are most relevant:

- **850760:** Lithium-ion accumulators. This is the most common code for modern BESS units and modules. For example, "ENERGY STORAGE MODULE LITHIUM-ION BATTERY" is often classified under 8507.60.00.

A comprehensive list of HS Codes can be found: https://wits.worldbank.org/trade/country-byhs6product.aspx?lang=en

Imports from trading partners - HS Code specific.xlsx

This file is from the **WTO Tariff & Trade Data** platform, specifically from the **Analytical Database (ADB)**, and provides the **Imports by Partner (in US dollars)** from other WTO members for the last 5 years (2020 to 2025). The data provided is based on **HS Codes** (Harmonized System) codes that is a global product classification system for trade data.

This data set (specifically for the relevant HS codes of large electrical equipment) refers to trade statistics showing the value of goods a country imports, disaggregated by the country of origin (the "partner" country). This data helps identify where a country sources its imports for specific products or overall.

The following data fields are provided in this data set:

- **reporter_name:** This is the name of the country that is importing the goods and therefore "reporting" the import transaction to the WTO or other international data compilers. For example, if you are looking at Canada's imports, "Canada" would be the reporter_name.
- **year:** This indicates the calendar year in which the import transactions occurred and were recorded. Trade data is typically aggregated annually.
- **HS Code:** This is the Harmonized System (HS) code, an internationally standardized system of names and numbers to classify traded products. Please see the previous data file's HS code definitions
- **partner_code:** This is a standardized code (e.g., ISO alpha-2, alpha-3, or a WTO-specific numerical code) that identifies the "partner" country. In the context of "Imports by Partner," this is the country from which the goods are being imported. This is generally

the country of origin, but sometimes statistical methodologies might record the country of consignment (the country from which the goods were dispatched to the reporting country).

- **partner_name:** This is the full name of the partner country corresponding to the partner_code. So, if the partner_code was "DEU" (ISO alpha-3), the partner_name would be "Germany." This field makes the data more human-readable.
- **value:** This represents the monetary value of the imported goods for the specified HS Code, from the specified partner country, in the given year.

Logistics Performance Index (LPI) – 2023.xlsx

This data file comes for the World Bank: https://lpi.worldbank.org/international/scorecard

The Logistics Performance Index (LPI) is a scorecard that provides a weighted average of country scores across six key dimensions of logistics and transportation worldwide:

- Efficiency of the clearance process (i.e., speed, simplicity and predictability of formalities) by border control agencies, including customs;
- Quality of trade and transport related infrastructure (e.g., ports, railroads, roads, information technology);
- Ease of arranging competitively priced shipments;
- Competence and quality of logistics services (e.g., transport operators, customs brokers);
- Ability to track and trace consignments;
- Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

The scorecard demonstrates comparative performance of all countries (world), regional and income groups. These fields are rated on a scale of 1 (low performance) to 5 (high performance) and each category is ranked overall:

- **Country Name:** The name of the country being assessed.
- **LPI Rank:** The country's overall rank based on its LPI score.
- **LPI Score (Overall):** The main Logistics Performance Index score, which is a weighted average of the six component scores. Reflects overall perceptions of a country's logistics performance.
- **Customs Score:** Score for the efficiency of customs and border management clearance (e.g., speed, simplicity, predictability).
- **Infrastructure Score:** Score for the quality of trade- and transport-related infrastructure (e.g., ports, roads, railroads, information technology).
- **International Shipments Score:** Score for the ease of arranging competitively priced international shipments.

- **Logistics Competence Score:** Score for the competence and quality of logistics services (e.g., transport operators, customs brokers).
- **Tracking & Tracing Score:** Score for the ability to track and trace consignments.
- **Timeliness Score:** Score for the frequency with which shipments reach consignees within scheduled or expected delivery times.

Doing Business - World Bank - Export Import Data.xlsx

The World Bank's "Doing Business" database provides "Trading Across Borders" indicators that measured the efficiency of importing goods. The "Time to Import" indicator quantifies the total calendar days required for all official procedures to clear a standardized cargo shipment from the port of entry to a warehouse in the importing economy's largest business city, encompassing documentary compliance (obtaining and submitting paperwork) and border compliance (customs clearance, inspections, and port handling), but excluding ocean transport time. The "Cost to Import" indicator measured all official U.S. dollar costs per container for these same documentary and border compliance procedures, including fees for documents, customs, inspections, and port/terminal handling, but critically excluding tariffs, duties, and international shipping costs. Both provided a standardized benchmark of procedural trade burdens.

Data file comes from: https://databank.worldbank.org/source/doing-business#

Fields:

- Trading across borders: Time to import: Documentary compliance (hours) (DB16-20 methodology) - Score
- Trading across borders: Time to import: Border compliance (hours) (DB16-20 methodology) - Score
- Trading across borders: Time to import (days) (DB06-15 methodology) - Score
- Trading across borders: Time to export: Documentary compliance (hours) (DB16-20 methodology) - Score
- Trading across borders: Time to export: Border compliance (hours) (DB16-20 methodology) - Score
- Trading across borders: Time to export (days) (DB06-15 methodology) - Score
- Trading across borders: Documents to import (number) (DB06-15 methodology) - Score
- Trading across borders: Documents to import (number) (DB06-15 methodology)
- Trading across borders: Documents to export (number) (DB06-15 methodology) - Score
- Trading across borders: Documents to export (number) (DB06-15 methodology)
- Trading across borders: Cost to import: Documentary compliance (USD) (DB16-20 methodology) - Score
- Trading across borders: Cost to import: Documentary compliance (USD) (DB16-20 methodology)

- Trading across borders: Cost to import: Border compliance (USD) (DB16-20 methodology) - Score
- Trading across borders: Cost to import: Border compliance (USD) (DB16-20 methodology)
- Trading across borders: Cost to import (US$ per container)(DB06-15 methodology) - Score
- Trading across borders: Cost to import (US$ per container deflated)(DB06-15 methodology)
- Trading across borders: Cost to export: Documentary compliance (USD) (DB16-20 methodology) - Score
- Trading across borders: Cost to export: Documentary compliance (USD) (DB16-20 methodology)
- Trading across borders: Cost to export: Border compliance (USD) (DB16-20 methodology) - Score
- Trading across borders: Cost to export: Border compliance (USD) (DB16-20 methodology)
- Trading across borders: Cost to export (US$ per container) (DB06-15 methodology) - Score
- Trading across borders: Cost to export (US$ per container deflated) (DB06-15 methodology)
- Trading across borders (DB16-20 methodology) - Score
- Trading across borders (DB06-15 methodology) - Score
- Time to import: Documentary compliance (hours) (DB16-20 methodology)
- Time to import: Border compliance (hours) (DB16-20 methodology)
- Time to import (days) (DB06-15 methodology)
- Time to export: Documentary compliance (hours) (DB16-20 methodology)
- Time to export: Border compliance (hours) (DB16-20 methodology)
- Time to export (days) (DB06-15 methodology)

3. Questions and Performance Assessment

In a **5-minute storytelling presentation (plus 5-minutes for Q&A)**, answer the following:

1. Which product category or portfolio is most vulnerable to supply chain disruptions? Create visualizations that identifies and highlights the risk levels for each product category and portfolio, based on data provided in this case study. Try to organize your insights based on both internal and external data sets, as well as other data and research that your team has found and seems relevant.
2. Suppose BC Hydro was hit overnight with a 25% imposed tariff on all imports from US suppliers. Which product categories and portfolios would be most vulnerable? What options are available to BC Hydro today that could mitigate such issues before they could become reality? What additional strategic approaches could BC Hydro consider, both in the short and long term, to better prepare for potential supply chain risks?

Each team will be assessed on three components for each question, namely the context, the method, and the insights. Specifically, industry judges are asked to evaluate you on:

- **CONTEXT:** How well did the team show their understanding of the context?
- **METHOD**: How well did the team utilize the data and proper analyses and explain them?
- **INSIGHTS:** How well did the team generate and present their insights?

NOTE:

- You are free to merge any of the datasets.
- You are free to use datasets beyond the above datasets, but you will not get any bonus points for doing so.
- You are free to use any software, e.g., Tableau, PowerBI, Python, R or anything you can imagine.