Cloud Service in the Electricity Industry

Electricity Canada

About Electricity Canada

Founded in 1891, Electricity Canada (formerly known as the Canadian Electricity Association) is the national forum and voice of the evolving and innovative electricity business in Canada. The association supports, through its advocacy efforts, the regional, national, and international success of its members.

Electricity Canada members generate, transmit, and distribute electrical energy to industrial, commercial, residential, and institutional customers across Canada. Members include integrated electric utilities, independent power producers, transmission and distribution companies, power marketers, manufacturers and suppliers of materials, technology, and services.

Acknowledgements

Electricity Canada recognizes the efforts of the Cloud Enablement Task-Group for this important initiative and to the many knowledgeable individuals who have contributed their time, support, and insights in preparing this report. We hope it provides the audience with the insights and necessary actions for positioning utilities to participate and thrive in the fourth great Industrial Revolution.

Contributing authors:

Andrew Costa, Promita Datta, Daniel Gent, Sarah Green, Quaiss Hotaki, Austin Janega, Connor Martino, David McGeadie, Stelios Pantazopoulos, Scott Pluggers, Ryan Potts, Stephanie Schiraldi, Ken Taylor, and Brent Peterson.

Disclaimer

This publication was prepared by the Electricity Canada, Cloud Enablement Task Group. While the information contained herein is reliable under the conditions and subject to the limitation set out. The accounting guidance contained in this report is general in nature and is not intended to apply to every fact pattern. The accounting guidance in this report is based on our understanding of the pronouncements and interpretations available at the date of the report. As such, accounting standards and guidance could change and will have an impact onto the pronouncements and interpretations found within this report.

Glossary of Terms

Term	Definition
Cloud computing	A shared, remote hosted computing platform providing “on-demand” services consisting of servers, storage, databases, networking, software, data analytics, and artificial intelligence models. There are three major paradigms; software as a service (SaaS); platform as a service (PaaS); and infrastructure as a service (IaaS).
Deferral account	Pre-paid expenses which will be recognized as expense in a future reporting period. Deferral accounts can also be used in the same manner for revenue.
IaaS	Infrastructure as a Service (IaaS) delivers hardware networking capabilities through servers for networking and storage through internet connectivity services using a pay-per-use model.
PaaS	Platform as a Service (PaaS) encompasses both applications and hardware, networking, and storage as a pay-per-use model.
RPO	Recovery point objective is the maximum amount of data that can be lost after a recovery from a system failure, within acceptable limits to the organization.
RTO	Recovery time objectives is the amount of actual time an organization has to restore its processes to an acceptable operating level after a system failure.
SaaS	Software as a Service provides applications over the cloud using a pay-per-use model.
Total cost of ownership	The total cost of ownership is the purchase price and the on-going cost of operation and maintenance. The total cost of the asset’s lifecycle, including decommissioning.

Contents

Executive summary

The financial benefits, such as cost reduction, variable costs, and cost transparency are one of the reasons many companies are adopting the shared computing platform known as the cloud. Additionally, the cloud offers other benefits: speed, agility, flexibility, scalability, business continuity, green data centres, robust security, innovation, collaboration, and advanced technologies.

Companies outside the electricity sector often value being able to assign cloud costs to operational expenses to remove or decrease financial liabilities on the balance sheet. This leads to favorable debt ratios. For regulated electricity companies, capital investments contribute to shareholder return on investments, however, the financial treatment of cloud costs can serve as a significant barrier to taking advantage of cloud services. The purpose of this report was to research, analyze, and propose solutions to reducing or removing this barrier.

This research involved conducting reviews of existing literature. The main objective was to determine how companies can incentivize regulatory authorities to allow the capitalization of cloud enablement and utilization. The key observation is that delivering benefits to customers is central to any approach with the regulator.

Our strategic recommendations encompass the following solutions with greater detail found in the body of the report.

Recommendations	Stakeholders
• Regulators must evaluate and implement deferral accounts for capitalizing cloud services, with the consideration of moving towards full capitalization full cloud services.	Regulators
• Customer education and engagement regarding cloud services.	Electricity providers
• Identify regulatory recommendations on taken initial action on the use of deferral accounts, in utility rate proposals.	Electricity providers
• Demonstrate strong financial acumen by evaluating the total cost of ownership vs. cloud services	Electricity providers
• Take advantage of the current treatment of US GAAP to capitalize cloud computing implementation costs.	Electricity providers
• In partnership with Electricity Canada, develop a “Cloud Centre of Excellence and Innovation", with industry cloud-based resources in a shared repository.	Industry association
• Engage the International Accounting Standards Board (IASB) on adjusting IFRS rules for the capitalization of cloud computing.	Industry association and electricity providers

Purpose

The purpose of this paper was to research, analyze, and report on answers to following two business critical questions:

1. How can our customers benefit from the cloud computing platform deployed by technology leaders?
2. How do we incentivize regulatory authorities to approve more cloud capitalization?

As capital investments contribute to shareholder profitability, treatment of cloud services as operational expenses has served as a significant barrier to participation in what economists have termed, “the fourth great industrial revolution”. Implicit in this revolution is the expected achievement of extraordinary innovation and productivity.

An overview of the three main problem statements that we have focused on addressing is provided in the table below.

Table 1: Benefit challenges

Category	Background	Challenge
Financial benefits	As regulated entities our companies earn a rate of return on capital. Traditionally, our companies have earned a rate of return on our IT systems because they were hosted in capital intensive on-premises data centres. Owned and operated by industry companies. When third party cloud providers host our systems, and we pay a rent in the form of Software as a Service (SaaS) subscriptions or public cloud consumption. These expenses can not be capitalized and as such are treated as an operational expense.	It is disincentivizing to migrate IT systems to cloud because there is both a loss of revenue and an increase in operating costs. For this reason, there is resistance to migrate IT systems to the cloud from both internal and regulatory stakeholders.
Financial benefits	Regulatory groups are increasingly asking the industry to articulate how rate payers (i.e., industry customers) will benefit from the migration of IT systems from on-premises to cloud.	It is difficult to find quantifiable financial benefits of cloud migration that are compelling to rate payers. The financial return on investment (ROI) for cloud is not obvious or easy to articulate.
Non-financial benefits	Internal stakeholders are gaining efficiencies due to cloud-migration. However, it is difficult to quantify these non-financial benefits.	Non-financial benefits of cloud computing migrations are not as compelling to rate payers as compared to other industry related projects.

Methodology

The methodology to develop this report consisted of literature review, subject matter expert interviews and input from within the cloud and electricity industry. In addition to economic statistical and business case study analysis.

Industry cloud service case studies

Hydro One modernizes its IT infrastructure (Case Study 1)

The case study discusses Hydro One's IT transformation to meet stringent reliability targets, ensure low costs, and address the challenges of a changing utility landscape. The key points are as follows:

Client challenge: Hydro One, a Canadian electricity transmission and distribution utility, faces complex challenges, including maintaining reliability, managing costs, adapting to a changing energy landscape, weather events, security concerns, and emphasizing customer service.

Solution: To address these challenges, Hydro One undertook an IT transformation in four areas: IT and process visibility, IT and process costs, customer service, and increased agility and reliability.

Table 2: Case Study 1 Benefits

Benefit category	Benefit description
Single pane of glass	Hydro One implemented a VMware platform to monitor the new data center with a single pane of glass accessible from any device, enabling new application topology and reach.
IT transformation	The IT transformation resulted in cost savings, improved predictability, and reliability.
Server migration	Over 1,000 virtual servers were migrated to new hardware and software platforms from VMware, Oracle, and HPE, reducing legacy footprint and operating costs.
Composable infrastructure	The company adopted an intelligent composable infrastructure based on Intel processors, allowing flexible pooling of physical and virtual compute, storage, and resources for any workload.

Re-platforming SAP: Hydro One's SAP landscape, critical to its business processes, was moved to a new infrastructure based on HPE's composable infrastructure technology and VMware's virtualization capabilities. The migration was successful despite the challenges posed by the pandemic.

Preparing for cloud: The IT transformation laid the groundwork for a future move to the public cloud, leading to significant cost savings and improved management capabilities.

Organizational change management: Capgemini, the technology partner, implemented organizational change management to support the transformation and ensure successful implementation.

Results: The IT transformation resulted in an agile, modern, and supportable infrastructure, reducing operational costs, improving reliability, and offering financial predictability. The move away from a monolithic model allowed for standardized, scalable infrastructure that can be easily adapted for future growth and cloud migration.

Overall, Hydro One's IT transformation enabled the company to meet its business objectives, improve services, and prepare for future challenges in the utility industry.

Developing the electrical grid of the future (Case Study 2)

In 2019, Siemens, New Brunswick Power, and Nova Scotia Power were awarded $35.66 million in federal funding for the Smart Grid Atlantic project. The pilot project aimed to analyze the challenges and opportunities presented by Canada's energy transition. The partners promised to research and test how the grid of the future can optimize the integration of renewables, ensure grid stability, and manage decentralized distribution. The project's goal was to better manage electricity in the provinces, potentially reducing future electricity costs for consumers and greenhouse gas emissions.

The project developed a cloud-based Energy System Platform (ESP) to enable data analytics, connectivity, and customer-focused applications and services. Siemens developed the ESP software, while New Brunswick Power and Nova Scotia Power will provide the data, assets, and customer engagement for real-time testing.

Business continuity, disaster preparedness and recovery (Case Study 3)

This case study highlights the importance of disaster recovery and business continuity planning for utilities, especially during emergencies and extreme weather events. Legacy disaster recovery strategies can limit the benefits of cloud adoption, as simply moving outdated strategies to the cloud may not improve operational resilience.

Amazon Web Services (AWS) and Hydro-Québec’s approach to disaster recovery, included the Goldilocks zone concept. The Goldilocks zone refers to the optimal distance between data centres that ensures aggressive recovery point objectives (RPOs) and recovery time objectives (RTOs) while maintaining low latency for high availability applications. Too close or too far distances between data centres can introduce challenges in meeting RPOs and RTOs.

AWS provides disaster recovery options, including multi-Region and Active-Active architectures, allowing utilities to achieve near-zero RPOs and low RTOs. The AWS Canada (Central) Region, located in Montreal, exemplifies the Goldilocks zone principle, with sufficient distance between availability zones to reduce the risk of a single event impacting availability.

The article highlights Hydro-Québec's experience during Canada's Great Ice Storm of 1998, which prompted the company to upgrade and establish a more resilient power grid. AWS's Canadian availability zones benefit from the improved power grid and redundant design, providing customers with a resilient infrastructure.

“The ice storm gave us an opportunity to upgrade and establish a more robust and reliable power grid that could endure natural disasters and be repaired faster. It also allowed us to

implement an improved company-wide approach to ensure and measure resiliency," explains Christian Déjean, Chief of Economic Development & Strategy at Hydro-Québec.

Table 3: Case Study 3 Benefits

Category	Benefits
Improved resilience	Moving IT infrastructure to the cloud allows utilities to take advantage of cloud providers' redundant and geographically dispersed data centers, ensuring high availability even during emergencies and extreme weather events. The cloud's Multi-Region, Active-Active architectures can provide near-zero recovery point objectives (RPOs) and low recovery time objectives (RTOs), minimizing downtime and data loss.
Cost savings	Cloud adoption can lead to significant cost savings for utilities. By migrating virtual servers to cloud-based platforms, utilities can reduce the overall legacy footprint, leading to lower operating costs. Cloud services also allow utilities to scale resources up or down based on demand, optimizing costs according to usage patterns.
Agility and flexibility	The cloud's composable infrastructure based on advanced processors enables utilities to pool physical and virtual compute, storage, and resources, allowing for flexible configurations to handle any workload. This agility allows utilities to adapt quickly to changing energy landscapes, weather events, and customer demands.
Improved data management and analytics	The cloud-based Energy System Platform (ESP) enables utilities to leverage data analytics and gain valuable insights into their operations. This can lead to better decision-making, improved customer service, and optimized energy distribution.
Future proofing and innovation	Cloud adoption lays the groundwork for future innovations and technology advancements. By preparing for a move to the public cloud, utilities can take advantage of new services and solutions offered by cloud providers, keeping them at the forefront of technological advancements in the utility industry.
Environmental benefits	Cloud providers, like AWS, often prioritize using clean and renewable energy sources to power their data centres. By moving to the cloud, utilities can indirectly contribute to reducing greenhouse gas emissions by utilizing cleaner energy sources for their IT infrastructure.
Collaboration and diversity	Cloud adoption encourages collaboration with technology partners, post-secondary institutions, and local communities. This fosters knowledge sharing, gender diversity in the workforce, and intellectual property development in Canada's clean energy sector.

Overall, moving electrical utility IT infrastructure into the cloud offers improved operational resilience, cost efficiencies, flexibility, and the opportunity to embrace new technologies, positioning utilities to better meet market demands and address the challenges of the evolving utility landscape.

Analysis and discussion

Regulatory incentivization

Electric utilities in Canada face the potential risk of being unable to take advantage of the cloud value propositions, including:

1) Superior service at lower cost for customers.
2) Enhanced collaborative and innovation capabilities for employees.
3) Speed, agility, and business continuity, advantages for shareholders across various cloud use cases.

We recommend using a deferral account with a rate application, as a capital equivalent treatment, to incentivize regulatory authorities to approve progressive adoption of cloud services where it benefits customers, employees, and shareholders. A deferral will recognize expense in a future fiscal period. After successful implementation, the regulator should move towards a program that fully places cloud services expenses into cloud capitalization.

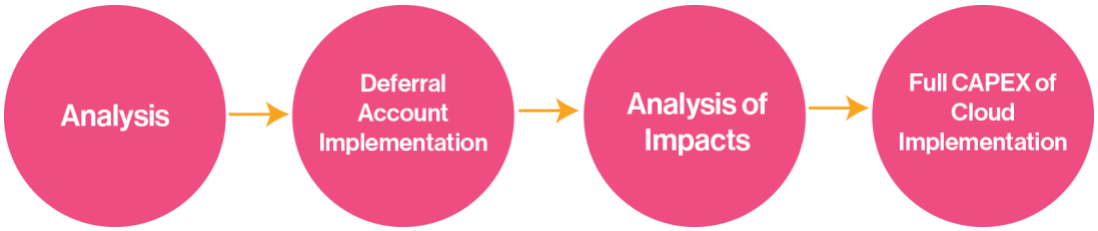
Generative Artificial Intelligence, Quantum Computing, DevOps Agile Development, and Infrastructure as Code are just some of the advanced, innovative technologies being provisioned by the cloud and embraced by the capital market.

Numerous electric utilities in the United States have been successful in receiving approval from their state regulator using a deferral approach. This action will better align the financial treatment of economic resources whether in the cloud or on-premises. The current gap between cloud and on-premises is exemplified below.

Table 4: Cloud versus on-premise capitalization profile

Cost	Category	Environment		
		On-Premise	**Cloud**	
			US GAAP	IFRS
Implement Software	Internal Use License*	Yes	Yes	Yes
	Cloud Access Only		Yes	No
Software	Internal Use License*	Yes	Yes	No
	Cloud Access Only		No	No
Hardware	Server Compute	Yes	No	No
	Storage	Yes	No	No
***Internal Use License provides right to run on-premise or host at other 3rd party.**				

Figure 1.0: Regulator considerations



Financial benefits

The total cost of ownership approach compares the financial benefits of the cloud versus the traditional on-premises data centre. The costs to procure and deploy racks, power, compute servers, storage, and network switches as direct costs are avoided (and baked into the cloud costs). Significant refresh costs and intensive security patching costs are often avoided with the Software as a Service (SaaS) model such as the Microsoft 365 Office productivity suite. This is in addition to providing employees with the most current collaborative, and innovative productivity.

Additionally, the number of employees required to provide technical and application-level support of cloud hosted solutions is less than its on-premise counterpart. This is especially relevant in a marketplace with skill shortages. A detailed cost comparison between cloud and on-premises operations for both the initial upgrade and continued sustainment is favourable for cloud as exemplified by recent implementations in the capital market. Companies report cost savings ranging from 20 to 50% over time using effective practices such as FinOps, automation, containers, and robust cost optimization methods though such cloud maturity requires time.

Figure 2.0 Total cost of ownership considerations

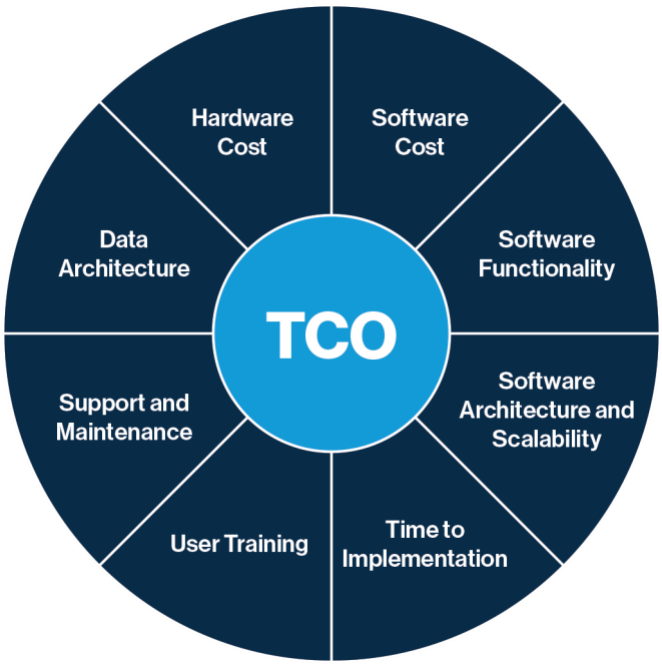


Table 5.0 and 5.1 is sample of a total cost of ownership worksheet that compares the cost of remaining on-premises versus migrating to a SaaS ERP system. Option 1 is the scenario where ERP applications remain on-prem in the traditional model.

Table 5.0: Sample total cost of ownership worksheet

	Baseline	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	10 Yr TCO
Option 1 - keep application/system on prem												
Opex												
Infrastructure Support												
Server Support	150,000	154,500	159,135	163,909	168,826	173,891	179,108	184,481	190,016	195,716	201,587	
Storage Support	50,000	51,500	53,045	54,636	56,275	57,964	59,703	61,494	63,339	65,239	67,196	
LAN/WAN incl DC Core	-											
Data Center Power & Cooling	50,000	52,500	57,750	63,525	69,878	76,865	84,552	93,007	102,308	112,538	123,792	
SW Licensing Support												
Server License Support	30,000	31,500	33,075	34,729	36,465	38,288	40,203	42,213	44,324	46,540	48,867	
Storage SW license Support	5,000	5,250	5,513	5,788	6,078	6,381	6,700	7,036	7,387	7,757	8,144	
Server OS Licensing (Windows SA, Linux, etc)	5,000	5,250	5,513	5,788	6,078	6,381	6,700	7,036	7,387	7,757	8,144	
Database SW Licenses Support & Maintenance	20,000	21,000	22,050	23,153	24,310	25,526	26,802	28,142	29,549	31,027	32,578	
Application SW Support & Maintenance from Vendor	1,200,000	1,260,000	1,323,000	1,389,150	1,458,608	1,531,538	1,608,115	1,688,521	1,772,947	1,861,594	1,954,674	
Other Finance Systems Annual SW Maintenance	300,000	315,000	330,750	347,288	364,652	382,884	402,029	422,130	443,237	465,398	488,668	
Middleware/Data Integration SW Support & Maintenance	300,000	315,000	330,750	347,288	364,652	382,884	402,029	422,130	443,237	465,398	488,668	
Application Support												
DBA & App Admin Support	300,000	315,000	330,750	347,288	364,652	382,884	402,029	422,130	443,237	465,398	488,668	
In house application support team	1,500,000	1,575,000	1,653,750	1,736,438	1,823,259	1,914,422	2,010,143	2,110,651	2,216,183	2,326,992	2,443,342	
Opex Subtotal	3,910,000	4,101,500	4,305,080	4,518,978	4,743,732	4,979,911	5,228,112	5,488,969	5,763,149	6,051,354	6,354,330	51,535,115
Other Opex												
Any other subscription services to augment on prem ERP	100,000	105,000	110,250	115,763	121,551	127,628	134,010	140,710	147,746	155,133	162,889	
Other Opex Subtotal	100,000	105,000	110,250	115,763	121,551	127,628	134,010	140,710	147,746	155,133	162,889	1,320,679
Capex												
ERP BI Upgrade			250,000					250,000				
HR System Upgrade			1,000,000					1,500,000				
Finance Core System Upgrade			2,000,000					2,500,000				
Other Finance Systems Upgrade			3,000,000					3,000,000				
Infrastructure Refreshes						1,000,000					1,500,000	
Capex Subtotal	-	-	6,250,000	-	-	1,000,000	-	7,250,000	-	-	1,500,000	16,000,000
Option 1 10-Year TCO	4,010,000	4,206,500	10,665,330	4,634,740	4,865,283	6,107,539	5,362,122	12,879,679	5,910,894	6,206,487	8,017,219	**68,855,794**
Cumulative TCO		4,206,500	14,871,830	19,506,570	24,371,853	30,479,392	35,841,514	48,721,193	54,632,087	60,838,574	68,855,794	

Option 2 is the scenario where ERP is deployed under a SaaS model, highlighted in Table 5.1 As can be seen here, there is a material total cost difference and savings with the SaaS model. Option 2 highlights a decreased TCO that is approximately $14 million less than Option 1, which used the traditional model.

Table 5.1: Total cost of ownership with a SaaS model

Option 2 ERP in Cloud SaaS model	Baseline	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	10 Yr TCO
Opex												
Infrastructure Support												
Server Support	150,000	154,500	159,135									313,635
Storage Support	50,000	51,500	53,045									104,545
LAN/WAN incl DC Core	-											-
Data Center Power & Cooling	50,000	52,500	55,125									107,625
												-
SW Licensing Support												-
Server License Support	30,000	31,500	33,075									64,575
Storage SW license Support	5,000	5,250	5,513									10,763
Server OS Licensing (Windows SA, Linux, etc)	5,000	5,250	5,513									10,763
Database SW Licenses Support & Maintenance	20,000	21,000	22,050									43,050
Application SW Support & Maintenance from Vendor	1,200,000	1,260,000	1,323,000									2,583,000
Other Finance Systems Annual SW Maintenance	300,000	315,000	330,750									645,750
Middleware/Data Integration SW Support & Mainten	300,000	315,000	330,750									645,750
												-
Application Support												-
DBA & App Admin Support	300,000	315,000	330,750									645,750
In house application support team	1,500,000	1,575,000	1,653,750									3,228,750
												-
Opex Subtotal	3,910,000	4,101,500	4,302,455	-								8,403,955
												-
Other Opex												-
Any other subscription services to augment on prem I	100,000	105,000	110,250									215,250
												-
												-
Other Opex Subtotal	100,000	105,000	110,250	-								215,250
New:												
Internal IT Support (App & DBA Services)	-	-	-	600,000	618,000	636,540	655,636	675,305	695,564	716,431	737,924	
ERP CLoud SaaS fees				1,250,000	1,312,500	1,378,125	1,447,031	1,519,383	1,595,352	1,675,120	1,758,876	
Opex Subtotal	4,010,000	4,206,500	4,412,705	1,850,000	1,930,500	2,014,665	2,102,667	2,194,688	2,290,916	2,391,551	2,496,800	25,890,993
Capex												
ERP BI Upgrade												
HR System Upgrade												
Finance Core Upgrade												
Migration to ERP Cloud (SaaS)		18,000,000	10,000,000									
Existing HR Modules to ERP Cloud SaaS				1,000,000								
Capex Subtotal	-	18,000,000	10,000,000	1,000,000	-	-	-	-	-	-	-	29,000,000
Option 2 10-Year TCO	4,010,000	22,206,500	14,412,705	2,850,000	1,930,500	2,014,665	2,102,667	2,194,688	2,290,916	2,391,551	2,496,800	**54,890,993**
Cumulative TCO		22,206,500	36,619,205	39,469,205	41,399,705	43,414,370	45,517,037	47,711,726	50,002,642	52,394,193	54,890,993	
Steady-State SaaS Cost						2,014,665	2,102,667	2,194,688	2,290,916	2,391,551	2,496,800	
10-year TCO of steady-state SaaS once fully migrated	**24,790,883**											

US GAAP and IFRS comparison

In addition to the customer value proposition of cloud solutions, this report will also highlight an existing disparity between two financial models which significantly influence a utility's ability to realize the benefits of cloud computing. US Generally Accepted Accounting Principles (US GAAP) will often enable the capitalization of software implementation costs, regardless of whether the customer retains the right to run the software on their own premises or with another 3rd party. Preliminary investigation shows a greater than 50% increase in costs attributed to OPEX under IFRS as compared to US GAAP. This partly explains the reason for having more cloud capitalization success stories for electric utilities in the United States. International Financial Reporting Standards (IFRS), relevant to many Canadian electric utilities, is more restrictive in the ability to capitalize cloud costs. Provided the electric utility retains the rights to run the software on-premises or with another 3rd party provider, and subject to additional conditions, some of the implementation costs may be capitalized. Under IFRS cloud costs must often be expensed in contrast to on-premises computing in which costs can often be capitalized.

The tables below demonstrate the outcome of three types of cloud solutions using IFRS and US GAAP. Electricity companies who are governed by IFRS accounting rules must choose between implementing the best technical solution and their balance sheet. All costs in the tables have been normalized using a total project cost of $1M. The distribution of costs for each sub-category is representative of actual project spend.

Infrastructure as a Service (IaaS)

An application is developed by the electricity company and is hosted on a cloud infrastructure solution such as Amazon Web Services (AWS) or Microsoft Azure. Costs associated with application development can be capitalized as it becomes the asset.

Table 5 illustrates a similar outcome for both financial treatment scenarios. Where, table 6 highlights a 52% higher attribution to costs under OPEX using IFRS standards.

Table 5: IaaS costs

	IFRS		GAAP	
	CAPEX	OPEX	CAPEX	OPEX
Project Costs - Total	906,667		906,667	
IaaS subscription costs (annual)		93,333		93,333
Total	906,667	93,333	906,667	93,333

Software as a service (SaaS)

Cloud based software solution hosted by a multi-tenant site with heavy integration effort to on-premises systems.

Table 6 highlights the difference between IFRS and GAAP when using SaaS. The project in this scenario realized 52% higher attribution of costs to OEPX with IFRS.

Table 6: SaaS costs

	IFRS		GAAP	
	CAPEX	OPEX	CAPEX	OPEX
Project Costs - Total		518,496	518,496	
Integration to on-premise systems	75,000		75,000	
IaaS subscription costs (annual)		406,504		406,504
Total	75,000	925,000	593,496	406,504

Platform as a service (PaaS)

Platform as a Service implemented with some configuration.

Table 7 highlights difference between IFRS and GAAP using PaaS. In this scenario the project realized 85% cost attribution to OPEX with IFRS.

Table 7: PaaS costs

	IFRS		GAAP	
	CAPEX	OPEX	CAPEX	OPEX
Project Costs - Total		848, 438	848,438	
Integration to on-premise systems	50,000			
IaaS subscription costs (annual)		39,063		39,063
IT Maintenance costs (annual)		62,500		62,500
Total	50,000	950,000	898,438	101, 563

SaaS (Exception for IFRS)

Cloud based software solution hosted in a multi-tenant site. Contract terms provide the ability for the customer to port the licenses to on premise any time in the future.

Table 8 highlights a specific case where SaaS is used with an exception for IFRS, resulting in a similar outcome for both financial treatment scenarios.

Table 8: SaaS exception

	IFRS		GAAP	
	CAPEX	OPEX	CAPEX	OPEX
Project Costs – Total	246,575		246,575	
Enhancements – Annual	136,986		136,986	
License/Subscription Costs - Annual	616,438		616,438	
Total	1,000,000		1,000,000	

Intangible benefits

The electricity industry which emerged in the late 1800s as ground-breaking technology has become an indispensable commodity, often taken for granted and overlooked despite its pervasive presence in modern life. In spite of electricity being seen as a slow-moving industry, recent technological advancements, alongside anticipated future growth driven by federal mandates and societal demands for clean energy, have triggered a rapid transformation.

Agility and flexibility

The industry is often criticized for not being agile enough. One of the key intangible benefits brought about by cloud computing within the utilities sector is the infusion of agility. Cloud technology facilitates the pooling of resources—physical, virtual, and storage - enabling industry players to create highly flexible systems capable of managing diverse workloads. From overseeing outage management systems (OMS) and asset management systems (AMS) to handling enterprise resource planning (ERP), this newfound flexibility empowers companies to swiftly adapt to evolving energy landscapes, unforeseen weather events, and dynamic customer demands. The agility afforded by cloud technologies empowers cloud adopters to cater to customer needs, providing many innovative digital services as well as enhancing overall customer satisfaction.

Applications

- **Adapting to changing landscapes:** Cloud-enabled utilities efficiently respond to changes in energy demand patterns that are influenced by factors like climate shifts or fluctuations in consumer behavior.
- **Diverse digital services:** Utilities leverage cloud capabilities to offer a myriad of digital services to customers, including e-billing, real-time consumption reports, outage notifications, self-service, chatbots, and comprehensive 360-degree customer views amalgamating multiple systems like OMS, AMS, ERP, and geospatial data. This allows utilities to better understand and serve customer needs.

- **Scalable Customer Service**: The frequency and intensity of severe weather events and other natural disasters causing electricity disruptions are on the rise. Addressing the rapid surge in customer inquiries during such occurrences can only be achieved through the utilization of cloud solutions that can dynamically scale. These solutions guarantee that customers can report service disruptions and stay informed about restoration timelines.

Predictive analytics and decision-making

Cloud-based energy management platforms serve as testing grounds for predictive analytics powered by machine learning and data analytics techniques such as cluster analysis. These technologies grant utilities invaluable foresight, aiding in predictive analytics for demand load changes and predicting potential outages triggered by incoming storms.

Practical implications

- **Improved decision-making:** Armed with predictive insights, utilities optimize capital and maintenance planning, enhancing the efficiency of resource allocation and service delivery.
- **Enhanced customer service:** Digital solutions fueled by cloud-derived predictive analytics ensure improved customer service by proactively addressing potential issues and optimizing energy distribution.
- **Improved service reliability:** Predictive analytics powered by cloud technology reduces downtime, ensuring customers have consistent and reliable access to electricity.
- **Customized offerings:** Insights derived from cloud-based analytics allow utilities to tailor offerings to individual customer needs, enhancing their experience.

Technological innovation

Cloud adoption within utilities will not only provide immediate benefits, it will also serve as a foundation for future innovations. As utilities take advantage of new services and solutions offered by cloud providers, they will continue to exist at the forefront of technological advancements in the industry.

Technological advancements

- **Quantum cloud computing:** Cutting-edge quantum computing offers utilities unparalleled benefits, from optimizing battery usage to fortifying cybersecurity measures and enhancing load management strategies.

Talent management and industry challenge

The electricity industry struggles with talent management due to a shortage of skilled IT professionals entering the sector. This scarcity has made cloud computing and related services an appealing option. However, the existing workforce must undergo upskilling initiatives to effectively handle and optimize these cloud computing services.

Skills gap mitigation: Bridging this skills gap becomes imperative for utilities to harness the full potential of cloud technologies, ensuring seamless integration and optimal utilization.

Changing landscape

The discourse surrounding an electricity company's migration to cloud technology has predominantly concentrated on defining the advantages of these solutions in comparison to their on-premises equivalents. This is a notable oversight in acknowledging a substantial market shift towards subscription-based models.

An illustrative instance of this paradigm shift is evident in Office Productivity Tools, where a subscription model has become the exclusive option. Similarly, providers of fundamental solutions such as Enterprise Resource Planning (ERP) have declared cessation dates for on-premises alternatives. These providers, akin to numerous others, are strategically channeling all growth and developmental efforts into their cloud platforms. An ERP system is a substantial investment for Utilities, and many are struggling to navigate its impact on financial statements if the costs cannot be capitalized.
In tandem with the pervasive transition towards cloud solutions, recent years have witnessed providers of on-premises solutions forsaking Perpetual Licensing in favor of the more financially stable Term Licensing. This transition exacerbates the challenge of recuperating costs through the rate base.

Given these pervasive market trends, Utilities are increasingly turning to their Regulators in search of a resolution to sustain their financial viability.

Regulatory hurdles and opportunities

Even with all the benefits and possibilities for future innovation, cloud services and solutions are still difficult to administer within a rate regulated industry. The incorporation of cloud services within a rate-regulated industry presents challenges due to the current regulatory framework and accounting standards. While adoption and piloting of cloud solutions are underway, constraints in treating operational expenses related to cloud services as capital expenses limit the full exploration of these solutions.

Potential solutions

- **Accelerated adoption:** Regulators can play a pivotal role by enabling utilities to include cloud expenses in rate recoveries, thereby accelerating cloud adoption and benefitting both the industry and consumers.
- **Necessary regulatory mindset shift:** A paradigm shift in the regulatory mindset toward fostering rapid innovation within the industry would positively impact all stakeholders and pave the way for a more agile and forward-thinking utilities sector.
- **Customer impact:** A forward-thinking regulatory framework ensures that customer-centric utilities are not just reactive but proactive in meeting evolving consumer needs.

Societal benefit and collaborative evolution

Taking a proactive stance in adopting cloud services and solutions within the electricity industry goes beyond immediate benefits, sparking a transformation that deeply influences society. By aligning regulatory frameworks and accounting standards with the call for innovation, the utility sector can be better positioned to meet society's evolving needs, ensuring dependable, efficient, and sustainable energy services for all Canadians.

The adoption of cloud services doesn't just enhance operational efficiencies. It acts as a catalyst, driving the sector towards a future characterized by innovation, flexibility, and improved service delivery. The alignment of technological progress, talent development initiatives, regulatory reforms, and a forward-looking industry collectively shapes an electricity sector ready for significant transformation and societal change.

Regulatory foresight

Ontario Energy Board accounting order

In November 2023, the Ontario Energy Board (OEB) formally established a deferral account to record incremental cloud computing implementation costs. In a letter issued on June 16, 2023 the OEB requested utilities companies within Ontario to complete a survey relating to their specific uses and practices surrounding cloud computing. KPMG was engaged to design a survey, perform review of cloud computing cost treatments, and develop potential options for OEB consideration in making a rule on the topic. This report has been attached as an appendix to this report.

In the letter and report, the difference in accounting treatments between IFRS and US GAAP were highlighted demonstrating the inconsistency amongst accounting standards. Furthermore, it would be beneficial to have a uniform approach for both IFRS and US GAAP to ensure that entities reporting under either framework are entitled to the same regulatory criteria.

Based on the findings presented in the OEB related KPMG report, the OEB has formally established two deferral accounts for Ontario utilities to record incremental cloud computing implementation costs that came into effect December 1, 2023. The OEB hopes the deferral account will:

- Remove regulatory barriers to adopting cloud solutions and foster technology advancement within the utilities industry.
- Allow cloud computing implementation costs in planning to be recovered outside of rate rebasing years.
- Mitigate potential inequity concerns in rate-based setting.
- Allow utility companies to reduce the rate impact to their customers from significant cloud computing implementation costs.

The establishment of the incremental cloud computing deferral account by the OEB is a step in the right direction in terms of addressing the issues surrounding cloud arrangements and the utilities sector. Moving forward, it would be advantageous for other provinces and regions to

follow with implementing similar deferral accounts to capture cloud computing implementation costs. Furthermore, in the future it would be beneficial to have additional cloud computing costs along with implementation costs to be capitalized in deferral accounts. As cloud computing costs that are typically expensed should qualify for rate recovery.

British Columbia Utilities Commission (BCUC) decision

BC Hydro successfully received approval from the British Columbia Utilities Commission (BCUC), on April 18, 2023, to establish a "Cloud Costs Regulatory Account". BC Hydro's financial statements are prepared using the International Financial Reporting Standards (IFRS). In the context of cloud computing, unless the software can be used on-premises or through cloud services, IFRS treats the one time, implementation costs as operational costs. The subsequent annual costs during testing activities must also be operational costs. BC Hydro submitted rate filings for 2023 – 2025 that assumed relevant implementation and testing activities are capital costs. At the time of submission, the ultimate destination of either on-premises or cloud for new business applications was not known. This approved application enables BC Hydro to maintain the existing rate structure and capitalization assumptions for 2023 – 2025, while using the "Cloud Costs Regulatory Account" as a deferral account for experienced variances, (unplanned operational costs), in the implementation and testing phases of these new business applications.

Recommendations

The following set of recommendations has been reviewed and suggested for further consideration by stakeholders. These recommendations will provide solid input into the adoption of cloud services within the industry allowing electricity providers the ability capitalize on existing cloud technology and future innovation.

- Regulatory bodies should evaluate the existing deferral accounts for cloud services in use by other regulatory entities. Once researched, the establishment of a trial period deferral account allowing for the implementation and accommodation of cloud services is recommended. Once the deferral account has been evaluated the regulator should examine to possibility of shifting cloud services costs to capital expenditures. **Stakeholder: Regulators**

- The International Accounting Standards Board must re-evaluate the existing surrounding cloud-computing services and make exceptions for regulated companies in a rate-regulated industry such as the electricity industry. **Stakeholder: Industry association and electricity providers**

- Emphasize and clearly articulate the value proposition to our customers. Our core competencies are the safe and reliable generation, transmission, and distribution of electricity services to our customers. The cloud offers a shared platform that uniquely enables deployment of advanced and innovative technologies. This results in a more

efficient and reliable electricity grid for our customers. **Stakeholder: Electricity providers**

- Rate-regulated utilities must submit rate proposals to regulatory authorities using a deferral account as a capital equivalency for cloud computing costs. This ensures costs are more aligned with on-premise capitalization treatment and provide economic benefits that extend beyond the current annual accounting period. Cloud dedicated hosts, multi-year reserved instance agreements, and hybrid portability of workloads are sample candidates that are conceptually more aligned with on-premise capital costing than the variable, “pay as you go”, cloud operational expense model. **Stakeholder: Electricity providers**

- Use a total cost of ownership approach to assess the financial aspects of workloads and to determine which workloads are best suited for cloud computing and which ones are better served by on-premises data centers. This combination of strong financial acumen and the FinOps framework can be used to optimize and reduce costs, over time, for workloads operating in the cloud. **Stakeholder: Electricity providers**

- Take advantage of the current financial treatment under US GAAP to capitalize cloud computing implementation costs where relevant and permitted, in addition to submitting rate filing proposals to our regulatory authorities for a capital equivalent deferral account. This will enable electric utilities to provide 1) superior services and experiences to our customers; 2) the provision of effective innovation, collaboration, and productivity capabilities to our employees; and 3) fair return to our shareholders. **Stakeholder: Electricity providers**

- Establish an Electricity Canada, “Cloud Centre of Excellence and Innovation”, consisting of volunteer participants, with robust competencies in setting cloud corporate strategy, governance, financial management, workload migration, and agile development. Sharing of cloud “best practices” and adoption of proven frameworks such as FinOps for cost optimization, will ensure electricity sector companies harvest both the financial and non-tangible benefits of cloud computing. **Stakeholder: Industry association**

- Establish an Electricity Canada shared repository documenting and referencing cloud capitalization success stories. This valuable resource will serve to augment the necessary due diligence and regulatory rate filing submissions which must be performed by each individual utility. In the United States, Edison Electric Institute, Advanced Energy Economy, and Gartner have been able to report on a significant number of cloud capitalization success stories in the utility sector. **Stakeholder: Industry association**

Conclusion

Implementing and capitalizing cloud services for the industry is truly a multi-stakeholder initiative, as identified by the recommendations. It is critical that regulators recognize the changing landscape and innovate their processes by removing regulatory barriers for the adoption of cloud services within the industry.

With growing struggles in the supply chain and talent pool, cloud services offer companies the flexibility needed reduce cost over the long-term and provide greater operational efficiencies and access to robust modern technology that is progressively only accessible through cloud architecture. These initiatives and functions will offer customers added flexibility from utilities managing their services.

Bibliography

Booth Wayne C. et al, *The Craft of Research Third Edition*, Chicago, IL: The University of Chicago Press, 2008.

KPMG, *Capitalizing the Cloud: An analysis of challenges and opportunities for the Canadian utilities*. Prepared for the Canadian Electricity Association and the Canadian Gas Association, March 2020.

Advanced Energy Economy and Edison Electric Institute (EEI), *Reaching for the Cloud: Solutions for Regulatory Parity for Cloud Services for Utilities*, February 2022.

Ghosh, Bhaskar and Karthik Narain. *What CEOs Need to Know about the Cloud*, Boston, MA: Harvard Business Review, March 2021.

Troy, Angelina C. and Khaser, Elias, Gartner, *Calculating and Comparing Data Center and Public Cloud IaaS Costs*, October 2017.

Wu, Caesar and Rajkumar Buyya, *Cloud Data Centers and Cost Modeling*, Waltham, MA: Morgan Kaufmann, 2015.

Data provided by Cloud for Utilities February 2021 survey with 39 investor-owned utilitiesresponding. Survey available upon request from Cloud for Utilities: https://cloudforutilities.org/

Regulatory Treatment of Cloud Computing Arrangements, adopted November 16, 2016. Available at: https://pubs.naruc.org/pub.cfm?id=2E54C6FF-FEE9-5368-21AB-638C00554476

Eric Masanet, Arman Shehabi, Nuoa Lei, Sarah Smith, Jonathan Koomey, Recalibrating Global Data Center Energy-Use Estimates, SCIENCE,

Vol. 367, Issue 6481, February 28, 2020. Available at: https://www.science.org/doi/10.1126/science.aba3758

Microsoft Cloud and WSP, The Carbon Benefits of Cloud Computing, 2020, p. 12. Available at: https://azure.microsoft.com/en-us/globalinfrastructure/ustainability/#carbon-benefits

Accenture, The Green Behind the Cloud, 2020, p. 3. Available at: https://www.accenture.com/_acnmedia/PDF-135/Accenture-Strategy-Green-Behind-Cloud-POV.pdf#zoom=40

https://www.capgemini.com/news/client-stories/hydro-one-modernizes-its-it-infrastructure-to-meet-market-demands/

https://www.newswire.ca/news-releases/siemens-canada-nb-power-and-nova-scotia-power-announce-92-7-million-project-to-develop-the-electrical-grid-of-the-future-834165669.html

https://aws.amazon.com/blogs/publicsector/goldilocks-zone-disaster-recovery-business-continuity-planning-disaster-preparedness/

https://ottawacitizen.com/business/local-business/amazon-chooses-montreal-for-its-canadian-data-centre-operations-due-to-hydro-costs

Cloud Standards Customer Council, *Migrating Applications to Public Cloud Services: Roadmap for Success, Version 2.0*, February 2018.

Cancila, Mindy, Gartner, *Solution Path for Developing a Cloud Strategy*, May 2016

Cancila, Mindy and Ahuja, Devanshu, Gartner, *Implementing Governance for Public Cloud IaaS and PaaS*, April 2017

Toombs, Douglas, Gartner, *Solution Path for Enabling Governance of Public Cloud Computing Strategy*, June 2018

Chermack, Thomas J. "Scenario Planning in Organizations: How to Create, Use, and Assess Scenarios", San Francisco, CA: Berrett-Koehler Publishers, 2011.

Chermack, Thomas J. "Scenarios+Strategy Information", accessed Jan21, 2014, http://www.thomaschermack.com/Thomas_Chermack_-_Scenario_Planning/Information.html

CMC-Canada, *Management Consulting: An Introduction to the Methodologies, Tools and Techniques of the Professio*n, Toronto, ON: 2010.

de Bono, Edward, *Opportunities: A Handbook of Business Opportunity Search*, London, UK: Penguin, 1979.

de Bono, Edward, *Lateral Thinking: Creativity Step by Step,* New York, NY: Harper, 1973.

de Bono, Edward, *Serious Creativity*, New York, NY: Harper, 1992.

de Bono, Edward, *Six Thinking Hats*, New York, NY: Harper, 1985.

Ghauri, Pervez and Kjell Gronhaug, *Research Methods in Business Studies (Fourth Edition)* Harlow, England: Financial Times Prentice Hall, 2010.

Hamel, Gary and C.K. Prahalad. *Competing for the Future,* Boston, MA: Harvard Business School Press, 1994.

Kotter, Kohn P. *Leading Change,* Boston, MA: Harvard Business School Press, 1996.

Nast, Jamie *Idea Mapping,* Hoboken, NJ: John Wiley & Sons, 2006

Porter, Michael E., Competitive Strategy, New York, NY: Free Press, 1980.

Porter, Michael E., Competitive Advantage, New York, NY: Free Press, 1985.

Schoemaker, Paul J. H., "Scenario Planning: A Tool for Strategic Thinking" *Sloan Management Review*, 36:2 (1995:Winter), 25-41

Wright, George and George Cairns, *Scenario Thinking, Practical Approaches to the Future*, New York, NY: Palgrave MacMillan, 2011.

Electricity Canada | Électricité Canada