NARUC
National Association of Regulatory Utility Commissioners

Regulators' Financial Toolbox: Leveraging Software as a Service, Cloud Computing, and Artificial Intelligence in Electric Utilities

The National Association of Regulatory Utility Commissioners (NARUC) Center for Partnership and Innovation (CPI) Regulators' Financial Toolbox series explores the types of financial tools utility regulators can use to support integration of electricity system technologies that benefit the public interest. This brief was prepared by Jeff Loiter, CPI Technical Director and Robert Bennett, CPI Technical Specialist, and is based upon work supported[1] by the Department of Energy under Award Number DE-OE0000925. The speakers' presentations and a recording can be found at www.naruc.org/core-sectors/energy-resources-and-the-environment/valuation-and-ratemaking/.

On December 18, 2024, NARUC's Center for Partnerships & Innovation (CPI) hosted a Regulators' Financial Toolbox Webinar on the topic of software-as-a-service, cloud computing, and artificial intelligence. The webinar featured opening remarks by the Honorable Philip Bartlett, Commissioner, Maine Public Utilities Commission; and presentations by Emma Rodvien, Manager, U.S. Regulatory Affairs and Market Development, Kraken; and Mimi Zhang, Director of Product Management, and Andrew Cook, Group Product Manager, Itron, Inc.

Context for Presentations and Discussion

The rapid evolution of Software as a Service (SaaS), cloud computing, and artificial intelligence (AI) is transforming the electric utility industry, reshaping operations, customer engagement, and financial models. This webinar introduced how utilities can deploy advanced software solutions and AI-driven analytics to improve grid efficiency, optimize asset management, and accurately forecast demand. The panel featured a discussion on the complexities and challenges associated with the financial and regulatory implications of these technologies, with a spotlight on real-world case studies and lessons learned from early movers.

[1] This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

As utilities adopt cloud computing to handle the vast amounts of data generated by advanced meters and greater numbers of distributed energy resources, concerns emerge about data privacy, cost recovery, and how these investments fit into the traditional rate base model. Additionally, the transition to cloud-based platforms and AI solutions increases upfront costs and ongoing expenses, raising critical issues for utilities, regulators, and consumers. Key topics included a focus on the use of SaaS in customer billing and IT systems, the evolution of the financial impact of these technologies on utilities' capital and operating expenses, a discussion of how these changes may affect rate structures, and an exploration of regulatory frameworks for cost recovery and revenue assurance in a digital, data-driven energy landscape.

Evolution of SaaS, Cloud Computing, and AI in Utility Operations

The webinar set the stage by discussing the transformative impact of SaaS, cloud computing, and artificial intelligence on the electric utility industry. Key points included:

- **Industry Transformation**: The session highlighted rapid technological advancements—new functionalities, innovative use cases, and enhanced risk mitigation strategies (including cybersecurity improvements and flexible commercial models). At the same time, utilities are transitioning away from legacy on-premise systems (in part as a result of specialized IT staff retirements) toward scalable and agile cloud-based solutions.[2]
- **Advanced Analytics & Grid Efficiency**: The speakers underscored that, beyond system modernization, these technologies are enabling utilities to deploy AI-driven analytics that improve grid efficiency, optimize asset management, and deliver more accurate demand forecasting. These tools support better decision-making in managing distributed energy resources and maintaining grid stability.
- **Financial Models and Rate Structures**: The discussion also addressed the financial implications of these transitions. With traditional systems, utilities incur a high upfront capex followed by lower operating costs. In contrast, SaaS models bundle licensing, hosting, and ongoing maintenance into predictable annual fees. This shift challenges regulators to rethink rate base models and revenue assurance frameworks, as utilities must now balance substantial ongoing investments with their regulatory cost recovery mechanisms.

SaaS Use Case Focus: Customer IT and Billing Systems

SaaS is revolutionizing billing and customer IT functions through:

- **Legacy Bottlenecks and Migration Challenges**: Traditional billing systems, often built to last 20 years with piecemeal upgrades, have become bottlenecks that slow innovation in rate design and customer engagement. In response, vendors are now promoting a modern, SaaS-based approach that replaces outdated on-premise systems.[3]
- **Derisked Migration Model**: Kraken presented its "build, operate, transfer" (BOT) model—a derisked migration strategy depicted as an S curve.[4] Instead of a costly "big bang" cutover (a term used to

[2] "NARUC Financial Toolbox webinar: SaaS in Utility Operations," presentation by Emma Rodvien, Senior Manager of Regulatory and Markets, Kraken Technologies, at slide 2 (December 18, 2024).
[3] Kraken at slide 4.
[4] Kraken at slides 8 and 9.

describe the traditional all-at-once migration method), Kraken divides the customer base into small cohorts. The easiest customers are migrated first, allowing the platform to mature incrementally until the legacy system can be fully retired. This approach reduces the risk of cascading costs and reconfiguration delays, as evidenced by contrasting examples such as the lengthy ConEd re-platforming project in New York.[5]

Regulatory and Vendor Perspectives

Both presenters stressed the importance of building a robust regulatory case for SaaS adoption, with detailed recommendations and challenges.

Cost Baselining and IT Interdependencies

Vendors need to compare the bundled, continuous costs of SaaS—covering ongoing upgrades and new features—with traditional models that split costs between capex and separate operating expenses. A clear cost baseline is essential, yet complicated by interdependencies with other IT systems and staffing requirements.[6]

Detailed Regulatory Recommendations

Regulators were urged to take practical steps to ensure SaaS alternatives are fully evaluated in procurement processes. Such measures would help align regulatory reviews with the evolving technological landscape and support fair cost recovery. These include:

- **Inventorying SaaS Use**: Identify how utilities currently employ SaaS products.
- **Assessing Legacy Systems**: Catalog which IT systems are nearing end-of-life and forecast expenditures on extensions or upgrades.
- **Analyzing Alternatives**: Require utilities to perform alternatives analyses that consider all potential solutions regardless of ownership models.
- **Ensuring IT Implementation Transparency**: Ensure utilities provide details on necessary tools, staffing, and interdependencies during procurement reviews.[7]

SaaS-Enabled Solutions and Performance Metrics

Itron's presentation showcased its comprehensive SaaS-enabled platforms that support utility operations beyond traditional metering.

- **Integrated Solutions and Grid-Edge Intelligence**: Itron demonstrated how its platforms integrate multiple functionalities—from meter reading and network management to advanced analytics—thus supporting grid-edge intelligence, customer engagement, distributed energy resource management, and even theft detection.[8]
- **Real-World Use Cases and Metrics**: As an example, Itron discussed CenterPoint Energy's use of Itron's AMI-related detection app, which reportedly achieved a 93% success rate in identifying outages and contributed to reduced maintenance costs. Itron highlighted that these integrated

[5] Ibid.
[6] Kraken at slide 10.
[7] Kraken at slide 11.
[8] "Leveraging SaaS, Cloud, and AI in Electric Utilities," presentation by Mimi Zhang, Director of Product Management, and Andrew Cook, Group Product Manager, Itron, Inc. at slide 19 (December 18, 2024).

solutions not only improve operational efficiency but also enhance the overall benefit-cost ratio of advanced metering infrastructure (AMI) deployments.[9]

- **Evolving Business Cases**: Itron's SaaS model supports evolving applications such as real-time analytics, outage management, and asset optimization, reinforcing the notion that utilities can leverage these digital tools to gain operational insights while also addressing regulatory and financial challenges. Further increasing the capabilities of an integrated platform to include demand response, conservation voltage reduction, distribution automation, and energy efficiency may increase the benefits realized more than it increases total costs, thus improving the benefit-cost ratio of the investment.[10]

Summary of Webinar Q&A

How should regulators approach rate recovery and allocate expenses across various utility functions?

Regulators/utilities can start by analyzing the components of a SaaS fee. Unlike perpetual licensing, SaaS fees often include ongoing updates, new features, and maintenance. This structure could allow parts of the SaaS fees to be prorated or capitalized as CapEx . It is essential to distinguish between hosting costs (O&M expenses) and licensing fees to support utilities transitioning to SaaS. However, committing to long-term contracts is challenging, which might deter utilities from trying new products. Therefore, term licensing rules should be reevaluated, particularly for software hosted externally and less transferable to private data centers. A more flexible regulatory approach to accommodating these modern setups could be beneficial.

Kraken emphasized the importance of aligning costs with benefits, questioning whether those incurring costs were the same ratepayers receiving the benefits. It was also noted that clarity in defining outcomes for customer-facing and billing software is crucial, as such platforms often provide benefits beyond their immediate function, such as customer retention and demand response program uptake.

Can companies like Kraken and Itron help reduce costs or speed up the implementation of system changes like time-of-use rates? Are utilities concerned about losing control over their systems?

Speakers emphasized that utilities' resistance often stems from foundational challenges rather than a desire to maintain tight control over their systems. U.S. utilities frequently lack a comprehensive understanding of legacy system maintenance costs. This oversight makes it difficult for alternative providers to demonstrate the advantages of faster and less expensive solutions effectively. Utilities are interested in rate design and billing improvements, mainly when external vendors assume responsibility for implementation. However, a significant barrier remains a misalignment between traditional cost structures and new commercial models.

Utility operations also involve a high level of risk aversion, particularly concerning critical systems like data collection and network management. Rigorous testing processes, often costing millions of dollars per upgrade, are driven by the fear of disrupting essential services. This caution can lead to counterproductive practices, such as prioritizing narrowly focused fixes over comprehensive updates

[9] Itron, slide 28.
[10] Itron, slide 24.

that offer greater long-term reliability. If utilities adopt more automated and flexible systems, that could alleviate these challenges.

Inefficiencies often arise from each utility's unique, customized implementation. These variations limit opportunities for standardization and automation, thereby increasing the cost and complexity of changes. Greater standardization and automated testing processes could address many of these utility challenges, reducing manual work and accelerating the adoption of new technologies.

What are some applications that can be deployed quickly to benefit the electric sector, and how do they improve system flexibility?

New utility billing systems, although critical for system flexibility, are challenging to deploy quickly or incrementally. Interest in piloting advanced billing infrastructure to evaluate its effects on smaller customer cohorts under varying technologies is emerging. Such pilots are particularly effective in environments where specific billing or rate changes are anticipated. Kraken emphasized that billing systems are essential for aligning supply and demand through dynamic rate design. These systems influence customer pricing signals and inform generator operations, highlighting their importance in fostering innovation in retail rate designs to synchronize with market settlements.

Itron shows utilities an "Operations Optimizer" as an example of a rapidly deployable application. This software provides AMI operations and grid management analytics and can be operational within hours when standard interfaces are used. Itron emphasized that standardization significantly reduces deployment time and cost, while customized solutions often extend project timelines due to the complexity of integration requirements.

Operations Optimizer can address issues like non-technical losses and validate billing, which provides immediate operational benefits. While tools with cross-departmental applications can deliver substantial value, the distributed nature of the benefits can complicate decision-making. Solutions like Operations Optimizer can help reduce long-term costs and operational challenges compared to custom-built systems, which often overlook ongoing maintenance and operational needs.

What are the cybersecurity and data privacy concerns regulators should consider when transitioning to these technologies? Can concerns be addressed as part of a broader cybersecurity program that utilities should maintain?

Speakers emphasized that cybersecurity should be part of a larger utility program focused on integration and layering of security measures. Cloud providers also invest heavily in security, and utilities can leverage those investments by using approved providers while ensuring vendors add their own security layers. Consistency and standards like the Purdue model[11] and specific protocols are key, as they reduce the complexity and cost of custom solutions. Standardization makes implementation more efficient, scalable, and manageable.

[11] The Purdue model is a structural model for industrial control system (ICS) security that concerns segmentation of physical processes, sensors, supervisory controls, operations, and logistics. Long regarded as a key framework for ICS network segmentation to protect operational technology (OT) from malware and other attacks, the model persists alongside the rise of edge computing and direct-to-cloud connectivity. Source: https://www.zscaler.com/resources/security-terms-glossary/what-is-purdue-model-ics-security. Accessed 23 February 2025.

Utilities are increasingly facing questions about managing sensitive customer data, as they collect data for programs like income-based rates or service qualifications. Still, this data is often stored in disparate systems, leading to risks and inefficiencies. Regulators need to think about how utilities can balance privacy with accessibility, suggesting that sensitive data should be securely accessible for multiple utility operations to maximize its value. Utilities can ensure they derive sufficient benefits from the risky process of collecting and storing sensitive information rather than leaving it underutilized by optimizing how data is stored and utilized internally.