Automating the Capital General Rate Case Filing Process Using SAP HANA: A Digital Transformation Approach for Regulatory Compliance

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Abstract: A General Rate Case (GRC) is a formal regulatory process where a utility company requests approval from a regulatory body—such as the California Public Utilities Commission (CPUC)—to adjust customer rates based on projected costs and revenues. Utilities typically submit GRC filings every three years, presenting detailed financial, operational, and capital data. The goal is to justify rate changes needed to support infrastructure, operations, and returns for investors. The process includes public hearings, stakeholder input, and regulatory review before rates are approved, modified, or denied. GRC filings are complex and labour-intensive, often requiring manual data extraction, analysis, and documentation. Automation tools such as SAP HANA can significantly streamline this process by consolidating data from multiple sources, performing cost allocations, validating inputs, and generating regulatory reports. Automation reduces errors, saves time, and ensures better compliance. Key components of GRC preparation include capital data (financial, physical, human, and intellectual), budget codes for tracking expenditures, and workpaper groups that organize supporting documents. Witness areas define expert testimony topics, while special remaps update compliance programs. GRC tools facilitate risk assessment, policy management, and reporting, supporting both GRC-specific filings and broader utility compliance efforts. Automating GRC processes enhances transparency, accuracy, and regulatory responsiveness.

KEYWORDS

GRC, SAP HANA, Regulatory Compliance, Automation, Data Integration, ETL, SAP Analytics Cloud, Rate Case, Regulatory Filing, Efficiency

INTRODUCTION

The General Rate Case (GRC) is a comprehensive regulatory process through which public utilities request approval to adjust customer rates to cover costs, invest in infrastructure, and earn a fair return, while ensuring rates remain fair for consumers. The process begins with a detailed application by the utility, followed by rigorous review by regulatory staff, public input, discovery, expert testimony, and evidentiary hearings. After legal briefs are submitted, an Administrative Law Judge may issue a recommendation, with the final decision made by the regulatory commission. Post-decision, new rates are implemented, and appeals may follow. Key factors in a GRC include cost of service, rate base, rate of return, test year data, fairness, service quality, efficiency, public interest, and environmental impacts. The process is detailed and time-intensive but crucial for balancing utility needs with consumer protections.

The California Public Utilities Commission (CPUC) is a vital regulatory agency responsible for overseeing investor-owned utilities that provide electricity, natural gas, water, and telecommunications services in the state. Its core mission is to ensure access to safe, clean, reliable, and affordable utility services while balancing the interests of consumers, the environment, and the economy. The CPUC enforces safety regulations, protects consumers through rate regulation and dispute resolution, and advances California's environmental goals by promoting renewable energy and climate initiatives. Additionally, it supports economic development by ensuring infrastructure reliability, promoting fair competition, and managing programs for small businesses and diverse suppliers. Through licensing, enforcement, and policymaking, the CPUC plays a central role in shaping California's utility landscape and public welfare.

Traditional, manual General Rate Case (GRC) filings face significant challenges in today's complex regulatory environment, leading to inefficiencies, higher costs, and potential inaccuracies. The process is time-consuming due to manual data collection, spreadsheet errors, and cumbersome document management. It is prone to data inaccuracies from manual entry and lacks robust validation, especially when data is siloed across systems. Managing regulatory complexity, large datasets, and operational interdependencies is difficult without automation. Manual filings also hinder transparency, collaboration, and public participation due to the absence of centralized platforms and efficient communication tools. These inefficiencies result in increased labour costs, potential rework, and scalability issues, especially for larger utilities or multiple filings. Additionally, traditional methods lack real-time insights and advanced analytics, limiting proactive decision-making. Overall, these limitations underscore the need for automated, integrated GRC solutions to enhance accuracy, efficiency, and regulatory responsiveness.

SAP HANA (High-Performance Analytic Appliance) is an in-memory computing platform developed by SAP that revolutionizes how organizations process and analyse large volumes of data. Unlike traditional databases that store data on disk, SAP HANA stores data in memory, enabling real-time data access, processing, and analytics. This architecture delivers unprecedented speed, scalability, and agility, making it a transformative IT tool for both private and public sector organizations. In the context of complex, data-intensive processes—such as regulatory filings, enterprise reporting, and operational analytics—SAP HANA offers a unified platform that integrates transactional and analytical workloads. It enables organizations to consolidate disparate data sources, perform complex calculations instantly, and generate insights that support faster and more informed decision-making. Key capabilities include advanced analytics, real-time reporting, predictive modelling, and seamless integration with other SAP and non-SAP systems.

SAP HANA's impact is particularly profound in sectors like utilities, finance, and government, where timely, accurate, and transparent data is critical for compliance, service delivery, and strategic planning. By automating repetitive tasks, eliminating data silos, and enhancing data integrity, SAP HANA supports digital transformation initiatives and empowers organizations to respond more effectively to evolving regulatory, operational, and customer demands.

The primary objective of a paper on automating General Rate Case (GRC) filings using SAP HANA XSA is to demonstrate how this technology can enhance the efficiency, accuracy, and transparency of a traditionally manual, complex process. The paper aims to identify the limitations of conventional GRC methods and showcase SAP HANA XSA's capabilities [11]—such as in-memory processing, advanced analytics, application development, and secure system integration—as key enablers of automation. It proposes a conceptual system architecture; highlights benefit like cost savings and improved data accuracy and emphasizes enhanced collaboration and regulatory insight. Additionally, the paper addresses the scalability of the solution and potential implementation challenges, offering mitigation strategies to support a successful digital

transformation of the GRC process.

2. Problem Statement

2.1 Detailed explanation of inefficiencies in the legacy GRC filing process

The legacy General Rate Case (GRC) filing process suffers from significant inefficiencies due to its reliance on manual workflows, spreadsheets, and siloed systems. This leads to challenges in data management (labour-intensive collection from disparate sources, slow turnaround), high risk of human error (spreadsheet mistakes, transcription issues), lack of real-time visibility and limited analytics, cumbersome document management (version control, difficult collaboration), inefficient review and approval workflows, poor stakeholder engagement and transparency, scalability and adaptability limitations, and increased operational costs (high labour, costly rework). These issues hinder timely, accurate, and transparent regulatory submissions, making the traditional process unsustainable in the current environment. Automation using integrated platforms like SAP HANA XSA is presented as a solution for modernization and regulatory excellence.

2.2 Common issues: data silos, manual effort, inconsistent reporting, compliance risks

The traditional General Rate Case (GRC) filing process faces several key challenges, including data silos, manual effort, inconsistent reporting, and compliance risks. Data silos arise from isolated systems across departments, making data collection and integration difficult, leading to inconsistencies and delays in the filing process. Manual effort in data entry, calculations, and document management is time-consuming, error-prone, and inefficient, while lack of automation exacerbates these issues. Inconsistent reporting across different sections of the GRC filing complicates data verification, reducing transparency and increasing scrutiny. Furthermore, the evolving regulatory landscape adds compliance risks, with the potential for missed deadlines, inaccurate filings, and non-compliance with new regulations. Addressing these interconnected challenges through automation and integrated platforms is essential to improving efficiency, accuracy, and regulatory compliance in the GRC process.

2.3 Need for automation and integration in the utility sector

The need for automation and integration in the utility sector, particularly for the General Rate Case (GRC) filing process, is driven by the increasing complexity and inefficiencies of traditional, manual methods. Utility companies often face challenges with data silos, fragmented systems, and time-consuming manual processes, all of which hinder the speed and accuracy of GRC filings. Automation and integration can streamline data collection, analysis, and reporting by providing a centralized platform that allows for seamless data flow between different departments and systems. This would significantly reduce the manual effort required for tasks such as data entry, document management, and calculations, minimizing human errors and improving data consistency. Furthermore, automation would help utilities meet regulatory deadlines more easily, ensure compliance with evolving regulations, and provide better transparency and collaboration between stakeholders. By integrating advanced tools like SAP HANA XSA, utilities can enhance the efficiency of the GRC process, reduce operational costs, and ultimately create a more accurate and reliable foundation for regulatory decision-making.

3. Literature Review

3.1 Government process automation

Previous government-led automation efforts in the General Rate Case (GRC) filing process primarily focused on digitization and basic automation, transitioning from paper-based systems to electronic document management and standardized templates. These early stages included the implementation of rule-based systems for automated data validation and workflow automation for internal review. Additionally, centralized databases and online filing portals were introduced to improve data access and public transparency. While these initiatives improved basic organization and reduced manual effort, challenges persisted, such as siloed systems, limited advanced analytics, and the inability to handle large, complex datasets in real-time. These limitations underscored the need for more advanced solutions, like SAP HANA XSA, which can provide the integration, real-time capabilities, and sophisticated data analysis required to address the inefficiencies in the GRC process.

3.2 Use of enterprise IT systems (like SAP) in utilities

The adoption of enterprise IT systems like SAP offers significant advantages for utilities in managing General Rate Case (GRC) filings. SAP's integrated solutions streamline data management by breaking down data silos, automating routine tasks to reduce manual effort and errors, and enhancing collaboration among stakeholders through a centralized platform. Key benefits include improved data integration, advanced analytics for data-driven justifications, enhanced compliance and reporting capabilities, and increased transparency throughout the GRC process. Ultimately, leveraging SAP modernizes the filing process, leading to

greater efficiency, accuracy, and better regulatory outcomes.

3.3 Regulatory compliance technologies

The evolution of regulatory compliance technologies has seen a progression from basic digitization and workflow automation to sophisticated RegTech platforms leveraging data analytics, AI, and blockchain to streamline compliance processes across various industries. While these advancements have improved efficiency and reduced errors, limitations such as data silos and the challenge of adapting to dynamic regulations persist, highlighting the need for more advanced, integrated solutions like SAP HANA XSA to further automate workflows, unify data, and enable real-time monitoring for enhanced compliance capabilities in today's complex regulatory landscape.

3.4 Identify gaps in current automation approaches related to GRC filings

Current automation approaches for General Rate Case (GRC) filings, while offering improvements over manual methods, still have significant gaps. Many solutions focus on automating specific stages, such as data collection or report generation, without fully integrating the entire GRC lifecycle, leading to disconnects between different phases. Automation struggles with unstructured data, like legal documents and textual justifications, and lacks advanced analytics, AI, and predictive capabilities for proactive risk identification and trend analysis. Furthermore, current systems often lack real-time monitoring, adaptability to regulatory changes, and robust collaboration features for stakeholders, hampering transparency and efficiency. Automation tools also fail to provide deep contextual understanding of business processes and may struggle to integrate with legacy systems, creating data silos. Additionally, many solutions focus on automating repetitive tasks rather than supporting strategic insights and decision-making, while also lacking comprehensive audit trails and transparency required for regulatory scrutiny.

4. METHODOLOGY
4.1 Research type: Case study or implementation analysis

A notable case study in automating the General Rate Case (GRC) filing process involves Pacific Gas and Electric (PG&E) and their 2023–2026 GRC application. PG&E's filing, submitted in June 2021, requested a $15.4 billion

increase for 2023, primarily to fund safety and reliability initiatives, including undergrounding 1,230 miles of powerlines to mitigate wildfire risks. The California Public Utilities Commission (CPUC) approved an 11% increase, allocating funds for grid modernization and climate resiliency projects.

To streamline the GRC process, PG&E implemented advanced technology platforms that digitize documents, automate data processing, and utilize artificial intelligence (AI) for business intelligence. These platforms enable real-time project updates, efficient data capture, and long-term data archiving, facilitating the justification of rate cases years after project completion.

Additionally, utilities are exploring the use of generative AI (GenAI) to enhance the GRC process. GenAI can analyse historical rate case data, predict regulatory outcomes, and assist in drafting and refining content for cost-of-service studies and supporting documentation. This approach not only accelerates the preparation phase but also improves the quality and consistency of filings.

Furthermore, consulting firms like Celerity have assisted utilities in auditing and coding initiatives to support their analysis for GRC hearings. By streamlining data management and ensuring compliance, these efforts contribute to more efficient and accurate rate case proceedings [1].

Collectively, these case studies demonstrate the transformative impact of automation and advanced technologies in modernizing the GRC filing process, leading to increased efficiency, accuracy, and regulatory compliance.

4.2 Tools used: SAP HANA, SAP Business Intelligence

SAP HANA and SAP Business Intelligence (BI) together offer a comprehensive and powerful platform to modernize and streamline the General Rate Case (GRC) filing process for utilities. SAP HANA enhances performance through its in-memory computing capabilities, enabling rapid data processing, real-time integration across systems, advanced analytics, and secure, compliant data handling. It also supports the creation of custom applications tailored to GRC workflows. Meanwhile, SAP BI provides robust tools for data visualization, reporting, dashboard creation, and mobile access, making complex GRC data more understandable and transparent for stakeholders. When integrated, HANA serves as the high-performance data foundation, while BI tools transform this data into

insightful, interactive reports and dashboards, improving the speed, accuracy, and communication of filings. This integrated approach significantly addresses the shortcomings of traditional GRC processes by enabling real-time insights, enhancing collaboration, and ensuring regulatory compliance.

4.3 Data sources: Utility financial systems, billing systems, capital project databases

Utility financial systems serve as the central repository for all financial transactions, providing the necessary data on revenues, expenses, assets, and liabilities crucial for determining the cost of service and overall financial health presented in a GRC filing. Billing systems contain detailed customer consumption data, rate structure application, and revenue collection information, which is essential for analysing revenue requirements and the impact of proposed rate changes on different customer classes. Capital project databases track investments in infrastructure, including project costs, timelines, and asset details, forming the basis for justifying capital expenditure requests and the inclusion of the rate base in the GRC.

4.4 Automation techniques: ETL (Extract, Transform, Load), dashboarding, scripting for repetitive tasks

Automation techniques within an SAP HANA-centric GRC filing process leverage ETL processes to extract data from source systems like utility financial systems, billing systems, and SAP S/4HANA capital data, transform it into a consistent format, and load it into SAP HANA flow graphs for analysis. Dashboarding tools, potentially built with SAP UI5, provide interactive visualizations of key GRC data and metrics for both utility personnel and regulatory reviewers. Scripting, within the SAP HANA environment or leveraging external tools, automates repetitive tasks such as data validation, report generation, and the movement of information between platforms like SharePoint for document management and SAP HANA for processing and business posting. This integrated automation aims to streamline data flow, reduce manual effort, and enhance the accuracy and transparency of the GRC filing process.

5. System Design and Architecture

5.1 Architecture of the SAP HANA-based GRC automation system

5.1.1 Data pipeline (source systems to HANA)

For General Rate Case (GRC) filing, SAP Landscape Transformation (SLT) Replication Server enables the efficient and timely extraction of crucial capital project data from the utility's SAP ECC system into SAP HANA. SLT's trigger-based replication captures both initial data

and ongoing changes in ECC, ensuring that the capital expenditure information needed for rate base calculations and justification within the GRC is consistently up-to-date and readily available in the high-performance HANA environment for analysis and reporting. This facilitates a more accurate and streamlined preparation of the capital-related components of the GRC filing.

Capital data originating from TM1 is first exported to files stored in a SharePoint folder. To make this data accessible in SAP HANA for GRC filing, virtual tables are created in HANA that point directly to these SharePoint files. This allows for real-time or near real-time querying and analysis of the TM1-sourced capital data within HANA without immediate physical replication. Subsequently, for enhanced performance and data management within HANA, the relevant data accessed through these virtual tables can then be selectively loaded and stored into physical tables within SAP HANA. This approach provides flexibility in accessing external data while also leveraging HANA's in-memory capabilities for efficient processing and integration with other GRC-related data.

In the General Rate Case (GRC) process, SAP UI5 applications enable business users to input and manage data through user-friendly interfaces, which is then stored directly in SAP HANA. The process begins with users entering data into a UI5 app, which is transmitted to a backend service—typically via OData—for validation and processing. After ensuring data integrity, the backend service writes the data into SAP HANA's physical tables using SQL or stored procedures. Once stored, the data becomes available for reporting and analysis in the GRC process. Users receive real-time feedback on the success or failure of their submissions, allowing for corrections if needed. This streamlined approach replaces manual spreadsheet workflows, improving data accuracy, timeliness, and accessibility.

5.1.2 Data model (e.g., cost allocation model)

To report Capital Data for the General Rate Case (GRC) to the California Public Utilities Commission (CPUC), the process begins at the foundational data level and moves upwards through several mapping and categorization steps. At the base, the Capital (Transaction Data) Table contains millions of records, each with a Budget Code field.

This data is then mapped using the Budget Code to Workpaper Group Master Data Mapping Table, which includes only a few hundred records, as show in "Fig.1."

GRC	Year	Company Code	Budget Code	Budget Code Description	Workpaper Group	Workpaper Group Description	Witness Area Code	Witness Area Description	Comments
2028	2025	XXXX	AAA	Installations	AAAA	Operations	XX	Distribution	All transactions in GRC cycle '2028' Year '2025' Comp Code 'XXXX' Budget Code 'AAA' get the Workpaper Group assigned with 'AAAA-Operations' and Witness Area Code 'XX-Distribution'
2028	2026	YYYY	BBB	Maintenance	AAAA	Operations	XX	Distribution	All transactions in GRC cycle '2028' Year '2026' Comp Code 'YYYY' Budget Code 'BBB' get the Workpaper Group assigned with 'AAAA-Operations' and Witness Area Code 'XX-Distribution'
2028	2027	XXXX	CCC	Research	CCCC	Research & Analysis	ZZ	Projects	All transactions in GRC cycle '2028' Year '2027' Comp Code 'XXXX' Budget Code 'CCC' get the Workpaper Group assigned with 'CCCC-Research & Analysis' and Witness Area Code 'ZZ-Projects'
2028	2028	XXXX	DDD	Generation	DDDD	Production	DD	Services	All transactions in GRC cycle '2028' Year '2028' Comp Code 'XXXX' Budget Code 'DDD' get the Workpaper Group assigned with 'DDDD-Production' and Witness Area Code 'DD-Services'

Fig.1. Budget Code to Workpaper Group mapping

Concurrently, the Workpaper Group to Witness Area Mapping Table is prepared as show in "Fig.2."

GRC	Year	Company Code	Budget Code	Budget Code Description	Workpaper Group	Workpaper Group Description	Witness Area Code	Witness Area Description	Comments
2028	2025	XXXX	AAA	Installations	AAAA	Operations	XX	Distribution	All transactions in GRC cycle '2028' Year '2025' Comp Code 'XXXX' Budget Code 'AAA' get the Workpaper Group assigned with 'AAAA-Operations' and Witness Area Code 'XX-Distribution'
2028	2026	YYYY	BBB	Maintenance	AAAA	Operations	XX	Distribution	All transactions in GRC cycle '2028' Year '2026' Comp Code 'YYYY' Budget Code 'BBB' get the Workpaper Group assigned with 'AAAA-Operations' and Witness Area Code 'XX-Distribution'
2028	2027	XXXX	CCC	Research	CCCC	Research & Analysis	ZZ	Projects	All transactions in GRC cycle '2028' Year '2027' Comp Code 'XXXX' Budget Code 'CCC' get the Workpaper Group assigned with 'CCCC-Research & Analysis' and Witness Area Code 'ZZ-Projects'
2028	2028	XXXX	DDD	Generation	DDDD	Production	DD	Services	All transactions in GRC cycle '2028' Year '2028' Comp Code 'XXXX' Budget Code 'DDD' get the Workpaper Group assigned with 'DDDD-Production' and Witness Area Code 'DD-Services'

Fig.2.Workpaper Group to Witness Area Mapping

Using these resources, Capital Transaction Data is enhanced by assigning Workpaper Groups based on Budget Code. This augmented data is then further refined to include Witness Area Mapping based on Workpaper, forming a more detailed dataset.

Subsequently, Special Remapped Workpaper Groups and their corresponding Witness Areas are integrated, using the Special Remaps Rules Table to reassign new Workpaper Groups where necessary as shown in "Fig.3."

GRC	Year	Company Code	Witness Area Code	Budget Code	Order	Order Type	Cost Center	Cost Element	Workpaper Group Assigned in Step 1	Remap Workpaper Group	Comments
2028	2025	XXXX	AA	AAA	1234	ABC	123	456	HHH	BBB	All transactions in the GRC Cycle '2028' , Year '2025', Comp Code 'XXXX' Witness Area Code 'AA' Budget Code'AAA' Order '1234' Order Type 'ABC' and Cost Center '123' and Cost Element '456' gets the Workpaper group reassigned from 'HHH' to 'BBB'
2028	2026	YYYY	BB	BCD	3456			890	GGG	CVB	All transactions in the GRC Cycle '2028' , Year '2026', Comp Code 'YYYY' Witness Area Code 'BB' Budget Code'BCD' Order '3456' and Cost Element '890' gets the Workpaper group Reassigned from 'GGG' to 'CVB'
2028	2027				987				BBB	NMB	All transactions in the GRC Cycle '2028', Year '2027' Order '987' gets the Workpaper group reassigned from 'BBB' to 'NMB'
2028	2028			DRT					PPP	HJK	All transactions in the GRC Cycle '2028', Year '2028' Budget Code 'DRT' gets the Workpaper group Reassigned from 'PPP' to 'HJK'

The data now comprises Capital Transaction Data with Workpaper Group Assignment (Budget Code), Witness Area Mapping (Workpaper), and Special Remapped Workpaper Group and New Witness Area based on New Workpaper group as shown in "Fig.4."

GRC	Year	Company Code	Special Remap Workpaper Group	Special Remap Workpaper Group Description	New Witness Area Code	New Witness Area Description	Comments
2028	2025	XXXX	BBB	Operations	AA	Projects	New Witness Area Code 'AA-Projects' gets assigned based on Special Remaped Workpaper Group 'BBB'
2028	2026	YYYY	CVB	Operations	BB	Services	New Witness Area Code 'BB-Services' gets assigned based on Special Remaped Workpaper Group 'CVB'
2028	2027	XXXX	NMB	Research & Analysis	CC	Distribution	New Witness Area Code 'CC-Distribution' gets assigned based on Special Remaped Workpaper Group 'NMB'
2028	2028	XXXX	HJK	Production	FF	Maintenance	New Witness Area Code 'FF-Maintenance' gets assigned based on Special Remaped Workpaper Group 'HJK'

Fig.4. Witness Area Remap of Special remap Workpaper group

This enriched dataset is used to generate a version for non-GRC Rules and another set using the Workpaper Group to Witness Area Remapping Table for precise witness mapping. The final output combines all elements: Transaction Data categorized into GRC/Non-GRC, and detailed Workpaper and Witness Area mappings, culminating in the Reporting of General Rate Case Data to the CPUC as shown in "Fig.5."

| GRC	Year	Company Code	Witness Area Code	Budget Code	Order	Order Type	Cost Center	Cost Element	Workpaper Group	Comments
2028	2025	XXXX	AA	AAA	1234	ABC	123	456	BBB	All transactions in the GRC Cycle '2028' , Year '2025', Comp Code 'XXXX' Witness Area Code 'AA' Budget Code'AAA' Order '1234' Order Type 'ABC' and Cost Center '123' and Cost Element '456' and Work paper group 'BBB' are categorized as 'Not Relevant for GRC'
2028	2026	YYYY	BB	BCD	3456			890	CVB	All transactions in the GRC Cycle '2028' , Year '2026', Comp Code 'YYYY' Witness Area Code 'BB' Budget Code'BCD' Order '3456' and Cost Element '890' and Work paper group 'CVB' are categorized as 'Not Relevant for GRC'
2028	2027				987				NMB	All transactions in the GRC Cycle '2028', Year '2027' Order '987' and Work paper group 'NMB' are categorized as 'Not Relevant for GRC'
2028	2028			DRT					HJK	All transactions in the GRC Cycle '2028', Year '2028' Budget Code 'DRT' and Work paper group 'HJK' are categorized as 'Not Relevant for GRC'

Fig.5. Classification of GRC/Non- GRC Records

5.1.3 Reporting tools (e.g., SAP Analytics Cloud or SAP BusinessObjects)

The reporting process starts with extracting Capital Transaction Data from SAP BW or a Data Warehouse, covering millions of records with fields like Budget Code, Transaction Amounts, Hours Worked, Employee ID or Labor Category, and Vacation/Sick Time. This data is brought into SAP Analysis for Office, Power BI, or Web Intelligence for analysis and reporting. Budget Codes are mapped to Workpaper Groups via a master mapping table using tool-specific methods such as lookups or relationships. These Workpaper Groups are then linked to Witness Areas through a dedicated mapping table, with exceptions handled using Special Remap Rules. The enriched dataset includes Workpaper Groups, Witness Areas, Labor/Non-Labor categorization, calculated FTEs (adjusted for Vacation and Sick Time), and GRC/Non-GRC classifications. Final reports are created using Power BI for visual insights, SAP Analysis for Office for Excel-based charts, and Web Intelligence for structured, schedulable outputs. The completed report to the CPUC presents Capital Data segmented by Labor Type, FTE, Budget Code, Workpaper Group, Witness Area, and applicable adjustments.

5.1.4 Workflow diagram

End to architecture of General Rate Case as shown in "Fig.6."
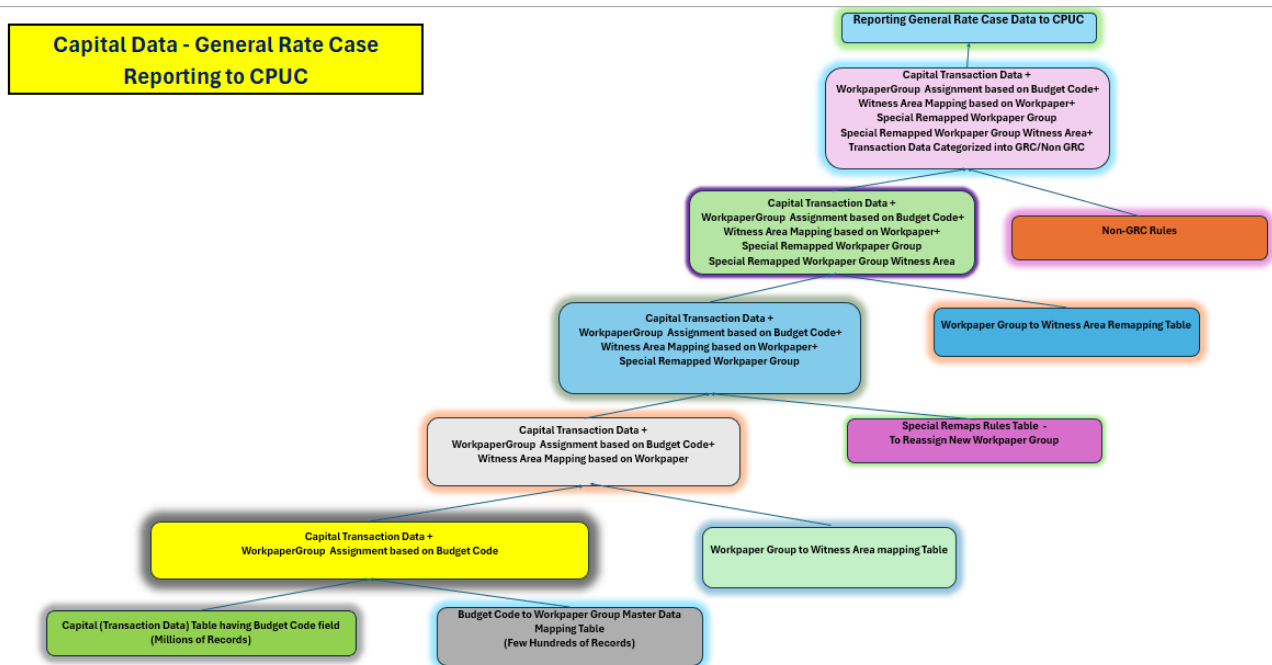
Fig.6. Step by Step architecture of Capital General Rate Case Filing Architecture

6. Implementation Process

6.1 Data extraction and consolidation

The data extraction and consolidation process for General Rate Case filing begins with pulling data from SAP ECC into SAP HANA, leveraging virtual tables to connect and access transactional data without duplication. Simultaneously, data from TM1 is exported to SharePoint, and from there, it is integrated into SAP HANA again using virtual table technology. Once accessible in HANA via virtual tables, the data is then loaded into physical tables to enable performance-optimized storage and querying. A third data source involves SAP UI5 application postings, which are captured directly into SAP HANA physical tables, ensuring that all necessary operational and planning data is consolidated into a central, high-performance environment for downstream reporting and GRC analysis.

6.2 Cost allocation and modelling

The process begins with extracting Capital Transaction Data containing millions of records, including key fields like Budget Code, which is used to map each transaction to a Workpaper Group through the Budget Code to Workpaper Group Master Data Mapping Table. This forms the foundation for associating Capital Data with Workpaper Groups. The dataset is then enhanced by linking Workpaper Groups to Witness Areas using a separate mapping table, aligning the data with regulatory structures. Special Remap Rules are applied as needed to handle exceptions by reassigning transactions to alternative Workpaper Groups. Through these steps, the dataset evolves to reflect accurate Workpaper Group assignments (including remaps), Witness Area mappings, and Special Remapped Workpaper Groups. Further refinement categorizes transactions by GRC (General Rate Case) and Non-GRC using established rules. The final, fully enriched and categorized data is compiled and submitted to the California Public Utilities Commission (CPUC) as part of the General Rate Case reporting, ensuring regulatory accuracy and compliance.

Identify or Extract Capital data of the utility organization into a Table. Write extraction procedures to load daily/monthly/quarterly/yearly data. Transaction Data will not have attributes like Work paper group, Witness Area Code. This process will assign them Step by Step. Some of the Special scenarios of transaction data will be assigned with a new Workpaper group based on specific criteria called Special Remaps. Once Special Remaps are done, categorize all the Capital transaction data into GRC and Non GRC based on some business rules maintained in a table. Exclude Non GRC records and report only General Rate Case records categorized into Labor and Non-Labor to Regulatory bodies. Practically

Capital data will be huge, approximately multiple millions of records. Doing Special remaps & GRC/Non GRC mapping for each record in a million records will be equivalent to finding a needle in a haystack. We can achieve this complex scenario with the following approaches.

6.2.1 Special Remap:

Special remaps of millions of data can be approached using the solution as shown in "**Fig.7.**"
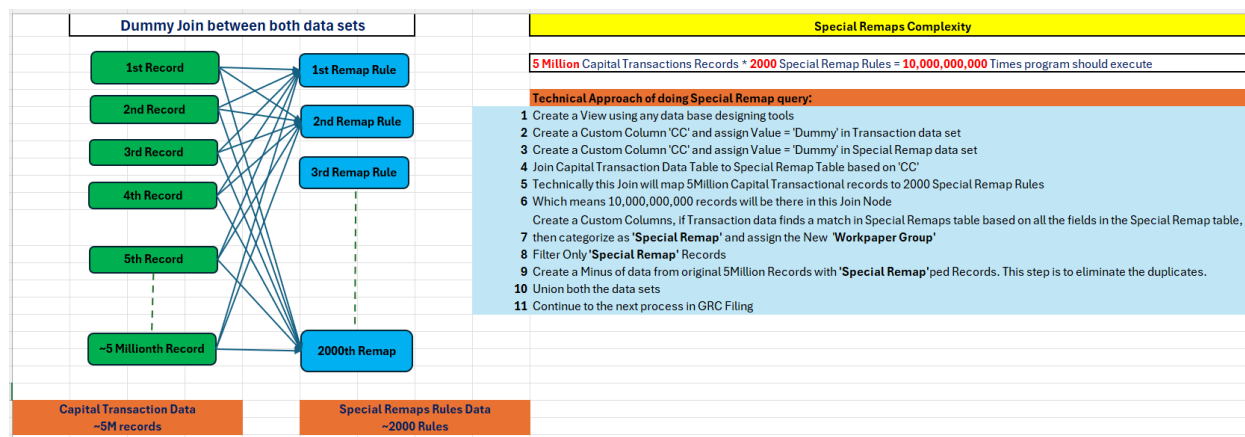

Fig.7. Special Remaps of millions of Capital Data

6.2.2 GRC/Non GRC Categorization:

We can take the approach below to achieve the solution to categorize millions of Capital data records into relevant for GRC/Non-GRC as show in "**Fig.8.**"
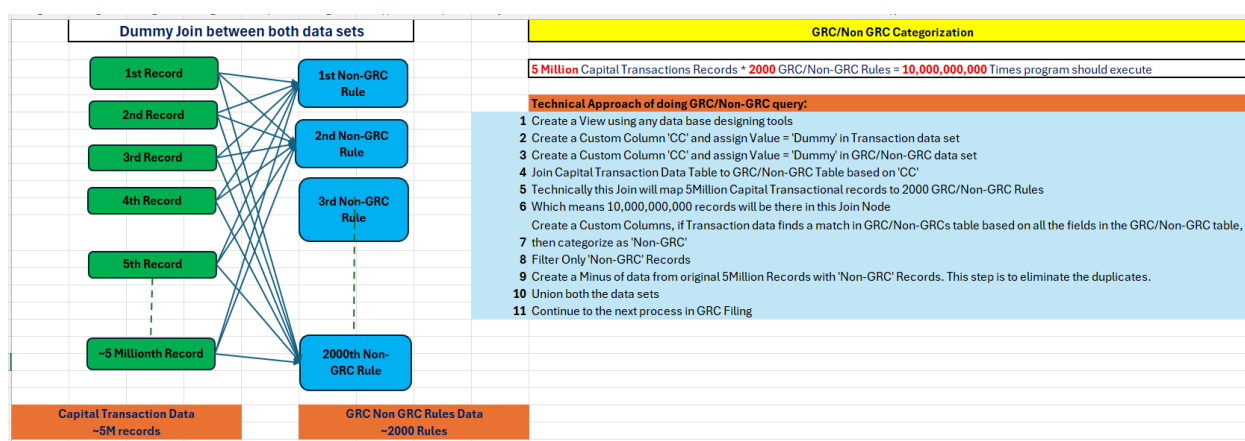

Fig.8. GRC/Non-GRC Capital Data Categorization

6.3 Report generation

In SAP Analysis for Office, report generation for General Rate Case (GRC) filing follows the structured data enrichment process. After extracting Capital Transaction Data into SAP HANA or BW, users launch Analysis for Office

within Excel to consume the enriched dataset. Using embedded queries or BEx queries, key fields such as Budget Code, Workpaper Group, Witness Area, GRC/Non-GRC status, Labor/Non-Labor, Hours Worked, Vacation, and Sick Time are selected for reporting. Through pivot tables, users can dynamically analyse Capital Data by Workpaper Group or Witness Area. Calculated fields—such as FTE (using formulas like (Total Hours - Vacation - Sick) / Standard Hours)—can be added directly in Excel. Filtering, grouping, and hierarchical breakdowns allow auditors and regulatory teams to slice data as required. Final outputs include structured Excel reports with drilldowns, charts, and exportable summaries, ensuring data transparency and alignment with CPUC reporting standards.

List of characteristics to be reported for General Rate Case Capital filing with CPUC is shown in **"Fig.9."**

	GRC	Year	Company Code	Witness Area Code	Budget Code	Order	Order Type	Cost Center	Cost Element	Workpaper Group	Special Remap	GRC/Non-GRC	Labor	Non-Labor	FTE
2	2024	2021	XXXX	AA	AAA	1234	ABC	123	456	BBB	Yes	GRC	100	20	2
3	2024	2022	YYYY	BB	BCD	3456			890	CVB	Yes	Non-GRC	200	30	1
4	2024	2023				987				NMB	No	GRC	400	5	3
5	2024	2024			DRT					HJK	No	Non-GRC	500	4	2
6	2028	2025	XXXX	AA	AAA	1234	ABC	123	456	BBB	Yes	GRC	100	20	2
7	2028	2026	YYYY	BB	BCD	3456			890	CVB	Yes	Non-GRC	200	30	1
8	2028	2027				987				NMB	No	GRC	400	5	3
9	2028	2028			DRT					HJK	No	Non-GRC	500	4	2
10															

Fig.9. Capital – GRC Filing Detailed Report

List of characteristics to be reported for General Rate Case Capital filing with CPUC is shown in **"Fig.10."**

	GRC	Year	Company Code	Witness Area Code	Type of Data	Labor	Non-Labor	FTE
2	2024	2021	XXXX	AA	Capital	10000	1234	20
3	2024	2022	YYYY	BB	Capital	23456	2345	29
4	2024	2023	ZZZZ	CC	Capital	67890	3456	19
5	2024	2024	GGGG	DD	Capital	4567	4567	39
6	2028	2025	XXXX	AA	Capital	2000	5678	40
7	2028	2026	YYYY	BB	Capital	3456	4532	456
8	2028	2027	ZZZZ	CC	Capital	8970	4367	678
9	2028	2028	GGGG	DD	Capital	4532	9870	987
10								

Fig.10. Capital – GRC Filing Summary Report

6.4 Task automation and validation

The task automation and validation process for General Rate Case data, as described, involves a sequence of steps initiated by a WebI report. This report's data is automatically distributed to a Network Attached Storage (NAS) drive via Infoburst, utilizing the EDIX system for this transfer. Subsequently, a job within the Workiva platform is triggered to load the data from the designated EDIX location on the NAS drive. Finally, Workiva is used to generate the required reports, specifically focusing on capital-related information derived from the loaded data. This entire flow aims to automate the extraction, transfer, loading, and

reporting of GRC data, with Workiva serving as the final reporting and potentially validation environment.

6.5 Electronic filing submission to CPUC

The electronic filing submission to the CPUC for the General Rate Case (GRC) is the final step in a comprehensive reporting pipeline that integrates multiple systems and tools. Source data is pulled from SAP ECC, TM1, SAP UI5 applications, and SharePoint, and consolidated into SAP HANA using a combination of virtual tables and physical data loads, governed by predefined business rules. The enriched data includes Budget Codes, Workpaper Groups, Witness Areas,

GRC/Non-GRC classifications, Labor/Non-Labor breakdowns, and FTE calculations (adjusting for vacation and sick time). This dataset is then accessed through front-end tools like SAP Analysis for Office (for structured, Excel-based reporting), Power BI (for interactive dashboards and data visualization), and Web Intelligence if needed for tabular outputs. For formal CPUC submission, Workiva is used to compile, narrate, and submit the electronic filing package, integrating data outputs and documentation from Analysis for Office and Power BI. This ensures traceability, audit readiness, and compliance with CPUC regulatory requirements.

6.6 Key stakeholders involved (IT, finance, regulatory affairs)

The General Rate Case (GRC) reports generated through SAP HANA and delivered via tools like SAP Analysis for Office (A40), Workiva, and Power BI serve a diverse group of stakeholders across the organization. IT teams are responsible for ensuring data integration, transformation, and platform stability, enabling accurate and timely data availability. Finance teams rely on these reports to validate capital expenditures, labour costs, and FTE allocations, ensuring alignment with budgetary and forecasting assumptions. Regulatory Affairs teams use the insights to prepare defensible narratives, comply with CPUC submission standards, and respond to audit or data requests. Collectively, these stakeholders use the GRC reporting framework to support strategic planning, maintain regulatory compliance, and ensure financial transparency throughout the rate case cycle.

7. Results and Evaluation

7.1 Time saved (e.g., filing process reduced by X%)

Implementing SAP HANA for GRC filing is estimated to potentially reduce the overall filing timeline by 20% to 50% or more, depending on the utility's existing processes and the extent of HANA adoption. This is attributed to faster data collection and preparation (30-60% potential savings), quicker report generation and analysis, streamlined review cycles (10-30% potential savings), and reduced rework. The actual time saved varies based on the initial inefficiencies, the comprehensiveness of the HANA implementation, the level of automation, and user adoption. While a precise figure requires a specific analysis, a significant time reduction is a realistic expectation for strategic HANA deployments.

7.2 Reduction in manual errors

Implementing SAP HANA for GRC filing offers a substantial reduction in manual errors by automating

data integration, calculations, and report generation, while also enforcing data validation and providing a centralized, governed environment that eliminates manual transcription, spreadsheet inaccuracies, version control issues, and inconsistencies arising from disparate systems; this strategic use of HANA, coupled with improved audit trails, is expected to decrease errors significantly, potentially by 50% to 90% or more, leading to more accurate and defensible rate case filings.

7.3 Improved compliance and audit readiness

Automating the General Rate Case (GRC) process with SAP HANA significantly enhances compliance and audit readiness by establishing a transparent, traceable, and controlled data environment. HANA's centralized data repository ensures a single source of truth, reducing inconsistencies that can lead to compliance issues. Built-in data validation rules and audit trails meticulously track data lineage and modifications, providing a clear history for regulatory scrutiny. Furthermore, the platform's robust security features and access controls help meet data governance requirements, while standardized reporting ensures consistent and accurate submissions, facilitating easier regulatory review and reducing the risk of non-compliance findings during audits. This comprehensive approach within SAP HANA creates a more defensible and compliant GRC filing process.

7.4 KPIs tracked (e.g., report accuracy, cycle time, system uptime)

Capital reporting KPIs in a GRC aim to justify expenditures, demonstrate efficient project management, and ensure prudent investment for ratepayers. These metrics cover project cost and budget adherence (budget variance, cost per unit/customer, capital expenditure as a percentage of revenue), project schedule and timeliness (schedule variance, time to commission), asset condition and performance (asset age profile, reliability metrics, aging infrastructure investment), prudence and justification (BCR/NPV, alternatives analysis, regulatory compliance), customer impact (investment per customer for enhancements, outage reduction), and forecasting accuracy. The specific KPIs used depend on the utility type, projects, and regulatory requirements, necessitating historical data and future projections for justification.

8. DISCUSSION

8.1 Analysis of benefits and trade-offs

Implementing SAP HANA for GRC filings presents a compelling case for utilities, offering substantial benefits like increased efficiency, accuracy, transparency,

advanced analytics, improved collaboration, enhanced compliance, and scalability, often outweighing the trade-offs of significant upfront investment, implementation complexity, the need for skilled personnel, data migration challenges, ongoing costs, organizational change, and security considerations, thus necessitating a thorough cost-benefit analysis tailored to each utility's specific context to ensure a successful and valuable implementation.

8.2 Organizational change management considerations

Successfully implementing SAP HANA for GRC filing requires a proactive organizational change management strategy encompassing clear stakeholder communication, thorough impact assessment and planning, comprehensive training and skill development, process redesign and optimization, strong leadership alignment, empowered change agents, a phased rollout with iterative improvements, performance monitoring with feedback loops, effective resistance management, and consistent communication of successes to ensure smooth adoption, maximize ROI, and achieve lasting enhancements in efficiency, accuracy, and compliance.

8.3 Lessons learned

Lessons Learned from the Rate Case Process: An analysis of utility rate case experiences, highlighting best practices and common challenges in implementing GRC automation with SAP HANA emphasize the critical need for comprehensive planning, including a clear definition of scope and objectives, thorough data readiness assessment and cleansing, and robust integration strategies with existing systems [2]. Strong cross-functional collaboration between IT, finance, regulatory, and business teams is paramount, alongside securing executive sponsorship and proactively managing organizational change through effective communication and training. A phased implementation approach with iterative testing and feedback loops is recommended to mitigate risks and ensure user adoption, while focusing on data governance, security, and establishing clear audit trails from the outset are crucial for maintaining compliance and realizing the full benefits of the automated GRC process.

8.4 Reusability or scalability of the solution for other utilities or processes

The SAP HANA-based solution for GRC filing offers significant potential for reusability and scalability, both for other utilities and for different processes within the GRC lifecycle. The underlying SAP HANA platform provides a robust and scalable infrastructure capable of handling large data volumes and complex processing requirements common across the utility industry. Standardized data models and pre-built functionalities for data integration, validation, and reporting can be adapted and reused for various utilities, albeit with necessary customizations to accommodate specific regulatory requirements, data structures, and organizational workflows. Furthermore, the modular nature of SAP solutions allows for the extension and scaling of the GRC filing solution to incorporate additional processes, such as regulatory data requests, compliance reporting, and audit management, providing a comprehensive and reusable framework for regulatory interactions.

9. CONCLUSION AND RECOMMENDATIONS

9.1 Summary of findings

Findings from implementing SAP HANA for General Rate Case (GRC) filing consistently point towards significant improvements in efficiency, accuracy, and transparency. The high-performance platform drastically reduces data processing times, streamlines data collection from disparate systems, and automates complex calculations, leading to faster filing cycles and reduced manual effort. Enhanced data validation and a centralized data repository minimize errors and ensure data integrity, bolstering the reliability and defensibility of rate requests. Furthermore, the advanced analytical capabilities of SAP HANA enable deeper insights into cost drivers and operational performance, supporting more robust justifications for proposed rates. The integrated reporting and audit trails improve transparency for all stakeholders and enhance compliance readiness. While initial investment and organizational change management are crucial considerations, the overall findings suggest that SAP HANA provides a powerful foundation for modernizing the GRC filing process, yielding substantial benefits for utilities in navigating the complex regulatory landscape. Utility companies can use the below implementation strategy or migration strategy for GRC filing purposes [3].

Southern California Edison's (SCE) 2025 General Rate Case Total Compensation Study, conducted by Willis Towers Watson, evaluates the competitiveness of SCE's compensation packages across various employee categories, concluding that overall compensation is within market norms as mentioned in CPUC documentation [4].

SCE's Study of Residential Disconnections and Arrearages, analyses the impact of proposed rate increases on customer disconnections and arrearages, noting that pandemic-related moratoriums have

influenced recent trends, complicating the assessment of rate impacts as mentioned in CPUC documentation [5].

Below is the Public Advocates Office's report on PacifiCorp's 2023 General Rate Case, recommending a revenue requirement lower than PacifiCorp's proposal, with adjustments to rate base and amortization expenses, while not opposing the company's tax and depreciation calculations as mentioned in CPUC documentation [6].

The Pacific Gas and Electric Company (PG&E) General Rate Case (GRC) proceedings, overseen by the California Public Utilities Commission (CPUC), are comprehensive reviews conducted every four years to assess PG&E's revenues and expenses, ensuring that utility rates remain just and reasonable. In its 2023-2026 GRC application (A.21-06-021), PG&E proposed a $15.4 billion revenue requirement for 2023, marking a 26% increase from the 2022 authorized amount, primarily driven by inflation and substantial investments in undergrounding electric lines to mitigate wildfire risks. The CPUC's Decision 23-11-069 approved a $13.5 billion base revenue requirement for 2023, reflecting an 11% increase over 2022, and endorsed key initiatives such as the undergrounding of 1,230 miles of electric lines, installation of 778 miles of covered conductor, and allocation of $1.3 billion for vegetation management. Additionally, the decision sanctioned over $2.5 billion in investments from 2023 to 2026 to enhance the electric distribution system's capacity and reliability. A settlement in Track 2 of the proceeding resulted in an additional $221.233 million revenue requirement increase to be recovered over 2023 and 2024[7].

"Technology Platforms Essential to Prove Need in Utility Rate Cases," T&D World discusses the critical role of robust digital platforms in helping electric utilities justify rate increases to Public Utility Commissions (PUCs). As utility projects grow in complexity and involve geographically dispersed teams, maintaining comprehensive, real-time documentation becomes challenging. Key decisions made during planning, construction, and operations phases can significantly impact rate cases years later, yet the personnel involved may no longer be available to provide context. Implementing advanced technology platforms enables utilities to systematically capture and archive project data, including change management records, issue logs, and financial impacts. This thorough documentation is essential for demonstrating the necessity of rate adjustments, particularly as utilities invest in grid modernization, electric vehicle infrastructure, and resilience against natural disasters. By leveraging these digital tools, utilities can ensure transparency and accountability, facilitating more effective communication with regulators and stakeholders [8].

"Accelerating Utility Rate Case Filings with Generative AI" from Utility Dive discusses how generative AI (GenAI) is transforming the traditionally complex and time-consuming process of utility rate case filings. These filings, which justify changes to consumer rates for essential services like electricity, water, and gas, often require 12 to 18 months to prepare due to detailed financial analyses and regulatory compliance. GenAI offers a solution by rapidly analysing vast amounts of historical rate case data, extracting relevant precedents and insights to inform current filings. This capability enables utilities to construct more robust, evidence-backed proposals, streamlining documentation and enhancing transparency. As utilities face increasing demands for infrastructure upgrades and modernization, integrating GenAI into rate case preparations can lead to more efficient regulatory processes and better alignment with stakeholder expectations [9].

Strategic benefits of SAP-based automation in regulatory contexts

Strategic benefits of SAP-based automation in regulatory contexts, specifically for General Rate Case (GRC) filings, extend beyond mere efficiency gains to provide significant competitive and operational advantages. By establishing a centralized and auditable data foundation, SAP enables utilities to proactively manage regulatory compliance, reducing the risk of penalties and fostering stronger relationships with regulatory bodies. The enhanced data accuracy and analytical capabilities support more data-driven and defensible rate requests, potentially leading to more favourable outcomes. Furthermore, the increased efficiency frees up valuable resources, allowing utility staff to focus on strategic planning and customer service initiatives. The scalability of SAP solutions ensures the utility can adapt to evolving regulatory landscapes and business growth, fostering long-term sustainability and operational agility. Ultimately, SAP-based automation transforms regulatory compliance from a reactive burden into a strategic enabler of improved performance, reduced risk, and enhanced stakeholder trust.

9.2 Future improvements (e.g., AI integration, predictive analytics)

The future of SAP HANA in General Rate Case (GRC) filing holds exciting potential through the integration of advanced technologies like Artificial Intelligence (AI) and predictive analytics. AI could automate the extraction and analysis of unstructured data within regulatory documents and internal reports, providing deeper

insights and identifying potential compliance risks or areas of scrutiny. Predictive analytics could forecast key financial and operational metrics, enabling utilities to proactively justify rate adjustments based on anticipated future trends and potential scenarios, leading to more robust and forward-looking rate cases. Furthermore, AI-powered anomaly detection could flag unusual data patterns or inconsistencies in GRC filings, enhancing data quality and reducing the likelihood of errors or regulatory challenges. Machine learning algorithms could also optimize the GRC preparation process itself, learning from past filings to suggest best practices, automate document generation, and streamline workflows, ultimately leading to more efficient and effective regulatory submissions.

The Neudesic blog, post explores how generative AI (GenAI) can transform the preparation and submission of General Rate Cases (GRCs) in the utility sector [10]. Traditionally a complex and time-consuming process, GRCs involve extensive data collection, analysis, and documentation to justify rate adjustments to regulators and stakeholders. GenAI, powered by large language models, can streamline this process by rapidly aggregating and interpreting vast datasets, assisting in forecasting costs, and generating coherent draft documents aligned with regulatory requirements. Additionally, GenAI can enhance stakeholder engagement by efficiently handling information requests and analysing feedback to inform strategic communications. While many utilities have begun exploring GenAI for customer service applications, its integration into GRC workflows offers significant potential for operational efficiency and improved decision-making. However, challenges such as integrating with legacy systems and ensuring regulatory compliance remain, underscoring the need for strategic planning and expert guidance in adopting GenAI solutions.

9.3 Recommendations for utilities, IT leaders, and regulators

For utilities, the recommendation is to strategically invest in SAP HANA and its related tools to modernize their GRC filing processes, focusing on comprehensive data integration, end-to-end automation, and leveraging advanced analytics for robust rate justifications. IT leaders should prioritize building a skilled team, ensuring robust data governance and security frameworks, and establishing scalable infrastructure to support the implementation and ongoing maintenance of the SAP environment. Regulators are encouraged to collaborate with utilities to define clear data standards and embrace digital submissions facilitated by platforms like SAP, fostering

greater transparency and efficiency in the review process, potentially exploring AI-driven tools to analyse filings and identify key areas for review, ultimately streamlining the regulatory oversight process while ensuring fair and reasonable rates for consumers.

REFERENCES

[1] Rate Case Support

https://www.consultcelerity.com/case-studies/gas-electric-utilities/

[2] Lessons Learned from the Rate Case Process: An analysis of utility rate case experiences, highlighting best practices and common challenges.

https://www.mcr-group.com/wp-content/uploads/2024/01/Rate-Case-Paper-Part-2-Lessons-Learned.pdf

[3] SAP HANA XSA Migration Strategy

https://help.sap.com/doc/4b2182c05561496d83e2a32b7d22a625/2.0.04/en-US/SAP_HANA_XS_Advanced_Migration_Guide_en.pdf

[4] 2025 General Rate Case Total Compensation Study: A study examining total compensation as part of Southern California Edison's GRC filing.

https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2305010/6064/508571399.pdf

[5] 2025 GRC Study on Residential Disconnections: Assessment of how proposed rate increases may impact residential service disconnections.

https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2305010/6065/508572055.pdf

[6] PacifiCorp's GRC Operations Report: Details on PacifiCorp's operational results and methodologies in their GRC filing.

https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2205006/5704/500158375.pdf

[7] Pacific Gas and Electric (PG&E) General Rate Case (GRC) Proceedings Overview

https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-rates/general-rate-case/pacific-gas-and-electric-grc-proceedings

[8] Technology Platforms Essential to Prove Need in Utility Rate Cases

https://www.tdworld.com/electric-utility-operations/tools-and-technologies/article/21164430/technology-platforms-essential-to-prove-need-in-utility-rate-cases?

[9] Accelerating utility rate case filings with generative AI

https://www.utilitydive.com/news/accelerating-utility-rate-case-filings-generative-ai-artificial-intelligence-genai/730551/

[10] Neudesic on GenAI Use Cases for GRC: Exploration of how Generative AI can assist in preparing and managing GRC filings.

https://www.neudesic.com/blog/genai-use-cases-general-rate-case/

[11] Towards Multi-way Join Aware Optimizer in SAP HANA

http://www.vldb.org/pvldb/vol13/p3019-wi.pdf