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Consequence Based Framework for Deployment of Cloud Solutions in the Digital Energy Transition

January 2025

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Changing the World's Energy Future

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Consequence Based Framework for Deployment of Cloud Solutions in the Digital Energy Transition

Background and Overview

This study introduces a framework for **evaluating cloud computing deployment** in the energy sector, focusing on the digital transition of energy systems. It examines the implications of cloud adoption on security, operational resilience and efficiency, shared responsibility, and offers a consequence-driven risk analysis approach to help utilities mitigate potential threats.

Solution

The framework (shown in Figure 1) is derived from **Cyber-Informed Engineering (CIE)**. It integrates consequence analysis specific cloud industrial control system applications. This furthers the current version of CIE to address physical, financial and cyber concerns responsibly, along with using quantitative decision science to apply the mitigations proposed in an optimal way. Most risk frameworks for cloud and electric grid, consider cybersecurity either as a bolt on end design, or the only consideration in the design. This approach enables a scaled set of choices within the power and cyber domains.

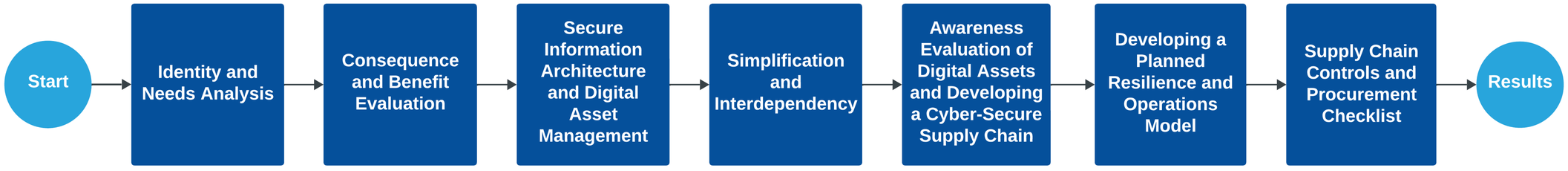

Figure 1. Key framework components.

Results

Key Items Covered in Report:

- Utility readiness and risk reduction steps
- Shared responsibility models
- Organizational benefits
- Potential consequences (Figure 2)
- Training and staffing recommendations

Additional Features:

- Customized RFP checklist for cloud solutions
- Cloud migration benefits
- Service scalability evaluation
- Support and maintenance commitments
- Framework assessment and growth potential visuals

Data Handling and Compliance:

- CSP (Cloud Service Provider) selection and framework phases

Summary

This paper examined the **application of cloud computing within the energy sector**, presenting emerging use cases, evaluating their risk-reward profiles, and establishing a comprehensive framework for consequence analysis.

Incorporating a consequence-informed and all-hazards analysis is pivotal for utilities to fully understand their risk-and-reward profiles when migrating to cloud services.

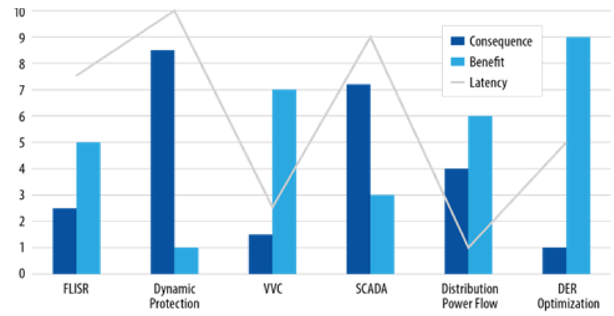

Figure 2. Summary of consequence analysis results.

For additional information visit https://inl.gov/CSDET

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