Case study on FINDER/ANAPLEX

Draft from GPT:

Below is a **case study page draft for ANAPLEX**, written to closely follow the **structure, length, and tone** of the Analytica case study you referenced ("EV Charging: A Win-Win for Utilities and Ratepayers"), while reframing the story around **AI data centers, electrification pressure, and utility financial risk**.

ANAPLEX: Planning Power for AI Data Centers in an Era of Rapid Electrification

Introduction

Electric utilities, regulators, and data-center developers are confronting one of the most consequential planning challenges in decades: **how to provide enough reliable, affordable electricity for rapidly growing AI data centers**—at the same time that electricity demand is already accelerating due to electric vehicles (EVs), building electrification, and broader decarbonization goals.

AI server farms can require hundreds of megawatts of firm power, often on aggressive timelines. Yet new generation capacity and transmission infrastructure typically take **five to ten years or more** to permit, finance, and construct. Utilities face shortages and long lead times for critical equipment such as gas turbines, escalating capital costs, and significant uncertainty about how much proposed data-center demand will actually materialize. That uncertainty is compounded by the possibility of an AI investment bubble bursting—or by breakthroughs in AI efficiency that sharply reduce future electricity needs.

At the same time, regulators and consumer advocates are increasingly concerned about **who pays**. If utilities build large amounts of new capacity to serve data centers, will the costs be borne by existing ratepayers through higher electricity prices? Or will special contracts and rate designs ensure that data-center customers bear the full incremental costs of the infrastructure they require?

Answering these questions requires tools that go well beyond traditional load forecasts or marginal cost studies. It requires an integrated view of **utility planning, investment,**

ratemaking, and long-term financial outcomes. ANAPLEX was created to provide exactly that perspective.

The Challenge

Historically, utilities planned for relatively predictable, incremental load growth. Today, that paradigm no longer holds.

Utilities now face:

- **Large, lumpy new loads** from AI data centers that can rival the demand of entire cities
- **Long development timelines** for new generation and transmission, often mismatched with data-center schedules
- **Capital cost escalation** and supply-chain constraints for generation equipment
- **Permitting and siting challenges**, especially for new transmission lines
- **Demand uncertainty**, including the risk that forecasted data-center load may never fully materialize
- **Ratepayer equity concerns**, as residential and small commercial customers push back against rising electricity prices

From a regulatory standpoint, the core question is no longer just *how much capacity is needed*, but *how investment decisions affect rates, earnings, and risk allocation over decades*. Traditional planning tools often examine only near-term system costs or marginal impacts, leaving decision-makers without a clear view of long-run financial consequences.

The Solution: ANAPLEX

ANAPLEX (Analytica Next-generation Analytic Platform for Long-term Electricity eXpenditure) is a utility-focused financial modeling platform built in Analytica to address these challenges.

ANAPLEX is derived from the **FINDER** (Financial Impacts of Distributed Energy Resources) model originally developed by researchers at Lawrence Berkeley National Laboratory. Over more than a decade, FINDER was publicly reviewed, vetted, and applied in multiple states to evaluate how new technologies affect utility shareholders and ratepayers. ANAPLEX extends and generalizes that foundation to support a wider range of electrification and large-load planning questions.

What ANAPLEX Does

ANAPLEX simulates how an investor-owned utility actually operates financially over a **20-year planning horizon**, explicitly modeling:

- **Utility investment planning**, including generation capacity expansion and distribution upgrades
- **Revenue requirement and ratemaking**, reflecting how costs are recovered through regulated rates
- **Shareholder outcomes**, such as achieved return on equity and earnings
- **Ratepayer impacts**, including changes in average retail electricity rates and bills
- **Alternative demand scenarios**, from unmanaged peak-coincident loads to strategically managed or phased demand growth

Crucially, ANAPLEX links **load growth, peak demand, infrastructure investment, and financial outcomes** in a single, internally consistent framework. This allows utilities and regulators to explore questions such as:

- How much new capacity is required under different data-center growth scenarios?
- What happens to rates if some anticipated load never materializes?
- How do special contracts or cost-allocation rules shift risk between data centers and other customers?

Example Application: EV Charging and Managed Load Growth

ANAPLEX builds directly on insights from its predecessor, FINDER, including a major study of EV charging impacts conducted by Lawrence Berkeley National Laboratory.

In that study, FINDER was used to evaluate how different EV charging strategies affect utility earnings and retail electricity rates over 20 years. The analysis showed that:

- **Unmanaged, peak-coincident EV charging** increases system peak demand, triggering costly generation and distribution investments
- **Managed charging**, which shifts EV load away from system peaks, reduces total infrastructure costs
- Under managed charging, **average retail rates decline by roughly 0.8–1.0%**, even as utility earnings remain higher than in a no-EV future

The key insight was that **load shape matters as much as load magnitude**. Strategic management of new electric demand can create outcomes that benefit both ratepayers and shareholders—a finding that is directly relevant to data-center planning today.

Relationship to ACES and Lumina's Energy Modeling Expertise

ANAPLEX complements Lumina's broader work in energy and electrification modeling, including **ACES** (Analytica for Cost-Effectiveness Solutions). ACES has been applied by utilities and regulators to evaluate demand-side management, energy efficiency, and electrification programs, with a focus on cost-effectiveness, avoided costs, and customer impacts.

Together, ACES and ANAPLEX allow decision-makers to examine both sides of the equation:

- **ACES** focuses on demand-side resources and program-level cost-effectiveness
- **ANAPLEX** focuses on system-level financial impacts, infrastructure investment, and long-term rate and earnings outcomes

This integrated capability is especially valuable as utilities confront simultaneous growth in EVs, building electrification, and AI-driven data-center demand.

Lumina has deep experience in helping utilities and others handle the inevitable risk and uncertainties. Examples include:

- **SEDS:** Stochastic Energy Deployment System a tool to help DOE evaluate and prioritize its portfolio of R&D projects in energy technologies, ranging from electric power (renewables, gas, nuclear) to vehicle efficiency, EVs, biofuels, hydrogen, and building efficiency), It assesses R&D fund allocation to portfolios in terms of future cost of energy, GHG emissions, and energy security. James Milford (then at NREL, now Lumina's Director of Consulting) was the lead designer, along with Max Henrion (CEO of Lumina) and collaborators at seven national laboratories.
- **Uncertainty-the book:** Max Henrion was …

Key Insights

Applications of ANAPLEX highlight several critical lessons for today's power system decisions:

- **Long-term financial impacts matter**: Near-term rate increases from infrastructure investments can be offset—or exacerbated—over time depending on how demand evolves.
- **Uncertainty must be modeled explicitly**: Scenarios where expected load fails to materialize can have substantial ratepayer consequences if investments are made prematurely.
- **Cost allocation is a policy choice**: Whether data centers pay incremental costs through special contracts or costs are socialized across ratepayers fundamentally changes outcomes.
- **Load management can be as important as supply**: Strategic shaping and phasing of new demand can reduce peak requirements and lower total system costs.

Credits and Origins

ANAPLEX is derived from the FINDER model developed by researchers at **Lawrence Berkeley National Laboratory**, including Andrew Satchwell, Juan Pablo Carvallo, Peter Cappers, James Milford, and Hadi Eshraghi, with funding from the U.S. Department of Energy. Lumina Decision Systems has extended and adapted this work within Analytica to support broader applications in electrification, data-center planning, and long-term utility financial analysis.

Sidebars

[Two special boxes or sidebars, should be inserted nearer the top.]

Why ANAPLEX — For Utilities & Regulators

- **Plan under deep uncertainty:** Test high, low, and partial-realization load scenarios for EVs, data centers, and electrification.
- **See long-term rate impacts:** Quantify how today's investment decisions affect customer rates over 20+ years.
- **Model real utility economics:** Capture generation, transmission, and distribution investment with regulated cost recovery.
- **Support defensible decisions:** Produce transparent, regulator-ready results for IRPs, rate cases, and stakeholder review.

Why ANAPLEX — For Hyperscalers & Data-Center Developers

- **Understand power availability risk:** See how timing of new capacity and transmission affects project schedules.
- **Clarify who pays for infrastructure:** Compare outcomes under standard tariffs versus special contracts.
- **Test demand uncertainty:** Explore financial consequences if load grows slower—or faster—than expected.
- **Engage utilities credibly:** Use a utility-realistic financial model to support negotiations and planning discussions.
