Case: CaLNG

Question 2:

Our analysis, based on 500 demand simulations, shows that a take-or-pay contract helps utilities by stabilizing costs and reducing price spikes from pipeline gas. It ensures a reliable LNG supply but also requires smart forecasting to avoid financial waste.

What Happens If a Utility Commits Too Much or Too Little?

- Too much LNG → The utility pays for unused gas, leading to unnecessary costs.
- Too little LNG → The utility relies on expensive pipeline gas, increasing overall costs.

Optimal LNG Commitment

Using the CaLNG-option-students.xlsx spreadsheet and running 500+ random demand scenarios, we determined that the optimal total intake from CaLNG (Cell D10) falls within the range of 900-940 MMcf. This level maximizes average savings while balancing the reduction of pipeline dependency and avoiding excessive overcommitment.

Based on our analysis, the 95% confidence interval for expected savings is $6,118.14 million to $6,920.79 million. This means that, with high certainty, committing within the 900-940 MMcf range leads to significant cost reductions while maintaining financial stability. This optimal range ensures utilities benefit from lower total costs, predictable energy expenses, and reduced risk from volatile pipeline pricing.

Question 3:

CaLNG has to choose between centralized storage at Coos Bay and decentralized storage through satellite tanks at different sites. We conducted a cost-benefit analysis using a Net Present Value (NPV) framework having a 15% discount rate and a 25-year investment plan, to figure out which is the financially superior option.

The centralized storage option at Coos Bay requires an investment of $9.5 million and makes use of 113 trailers to transport LNG to utilities. The trailers add a cost of $5.65 million and incur an annual operating and driver cost of $6.5 million. Given that trailers have a 10-year lifespan, the company will need to replace trailers in years 10 and 20. Additionally we've factored in depreciation, with tanks depreciating over 25 years and trailers over 10 years. At the end of year 25, trailers were assumed to have a resale value of 50% of their initial purchase price. The NPV for Coos Bay storage was calculated to be $81.78 million.

On the other hand, decentralized storage via satellite tanks requires a significantly higher up front investment of $79 million. This option provides local supply security and does reduce the daily transport dependency. However, its NPV is only $49.48 million, which is much lower when compared to the NPV

of the centralized storage despite having lower risk. This is due to high initial costs to acquire satellite tanks that increases the payback time, further decreasing profits.

Looking at the results of the analysis, the optimal distribution strategy for CaLNG is centralized storage at Coos Bay with a trailer-based distribution system. This model greatly reduces capital investment while boosting financial returns, ensuring cost-effective peak shaving for utilities. However, we could consider a hybrid approach, where important utility locations use small-scale satellite tanks in case of transportation disruptions or sudden demand increases. This structure provides a financially viable yet operationally resilient solution for LNG distribution.

Question 4:

There are several risks associated with CaLNG affecting its financial stability, operational efficiency, and lastly long-term sustainability. We are categorizing them into market, operational, regulatory, and external factors.

1. Market & Financial Risks:
CaLNG is facing a problem with the volatility of natural gas prices, as the market prices tend to fluctuate, which could potentially reduce the competitiveness of LNG offerings. Furthermore, there is contractual uncertainty in the market as utilities may hesitate to commit to long-term contracts because of overcommitment or any changes in the future. The situation is further complicated by demand uncertainty due to weather conditions and overall energy consumption fluctuations.

2. Operational & Supply Chain Risks:
Distribution in the LNG sector depends strongly on 113 trailers, which makes a problem for CaLNG as there could be potential threats to trailers like increases in fuel prices, equipment failures, or road congestion. Another problem is with storage capacity in terms of supply, if demand exceeds capacity, again we have a problem.

3. Regulatory & Environmental Risks:
There are strict government regulations on LNG operations, related to safety, emissions, and environmental compliance. Future carbon emission standards could increase compliance costs, which would impact the profit margins. Lastly land-use restrictions and permitting challenges could also increase if CaLNG tries to increase its storage capacity or try to make extra distribution points.

4. Geopolitical & External Risks:
Natural calamities such as earthquakes, wildfires, or storms could damage the supply chains for LNG. There could also be global supply chain level problems or geopolitical hurdles which could also affect CaLNG's ability to meet customer demand. Also, as the world is progressing, developed countries are trying to shift towards renewable energy sources (solar, wind) which would also reduce long-term LNG demand.