Electric Utility Portfolio Optimization

Dominion Virginia Power

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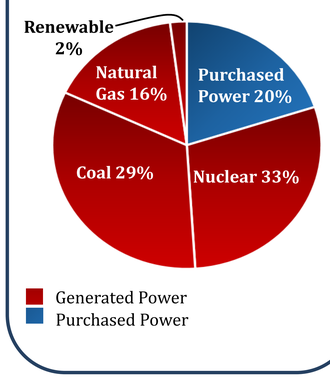
Estimated Cost Savings: $3.3 Billion

During Planning Horizon

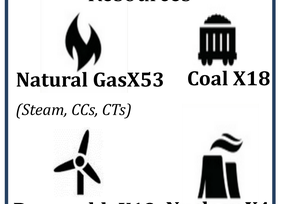
Client Background

Dominion Virginia Power is a regulated electric monopoly that is facing a growing energy demand

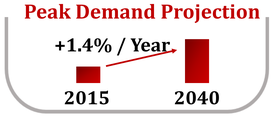
Dominion Virginia Power's Current Energy Mix



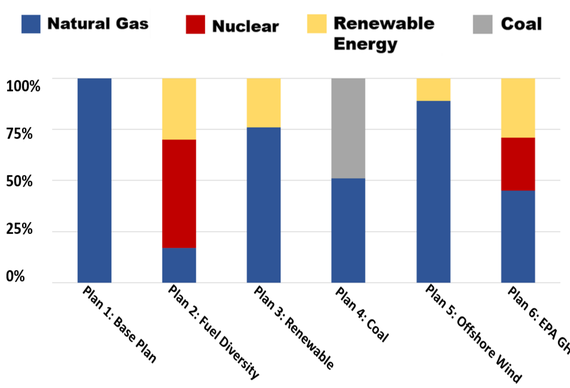
Existing Generation Resources



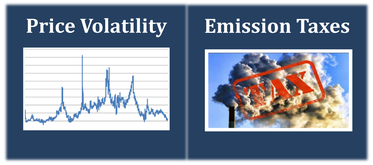
Peak Demand Projection



DVP's Six Future Plans



Problem Description



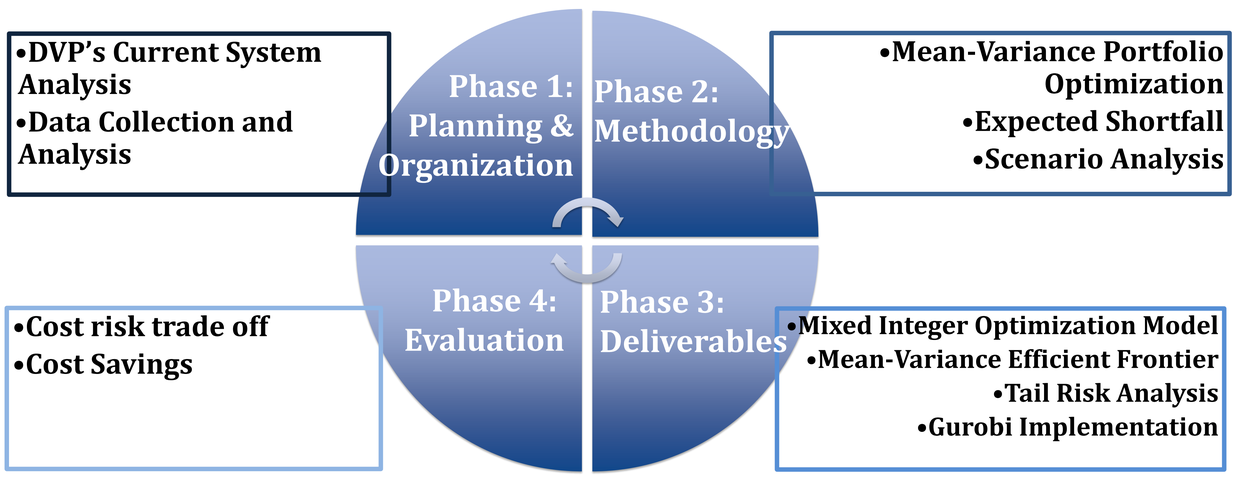
What should be built to meet regulatory requirements?

Existing model can't measure risk quantitatively

Project Goal

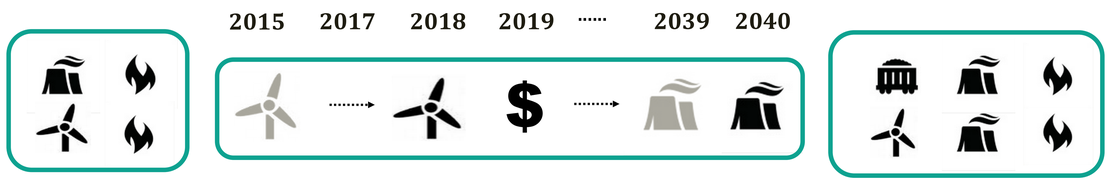
- Variability of Cost
- Value at Risk
- Expected Shortfall

Methodology Overview



Mixed-Integer Multi-Period Mean-Variance Portfolio Optimization Model

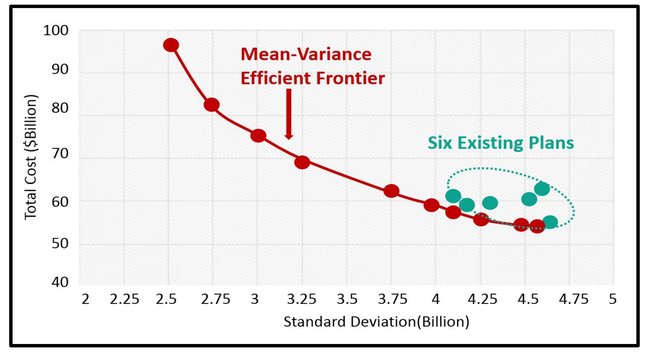
Current Infrastructure	Planning Horizon (Year 2015 – 2040)	Future Infrastructure



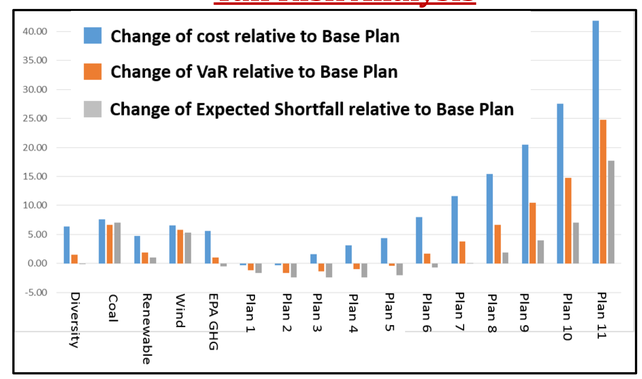
Objective Function	*Minimize total cost of portfolios for every given level of risk*
Important Constraints	*Peak Power Demand Constraint*
	Energy Demand Constraint
	Maximum Power Generation Constraint
	Portfolio Variance Constraint
	Expected Shortfall Constraint
	Lead Time Constraint

Deliverables

Mean-Variance Efficient Frontier



Tail Risk Analysis



Project Valuation