



The Ups and Downs of Market Cycles

EPIS Electric Market Forecasting Conference
October 15, 2009

Why Merchant Generation Projects Fail (Late 1990's early 2000's)

- Conventional Wisdom
(Issues Addressed In
Financing Documents)

- Dispatch/Capacity
Factor
- Counterparty Credit
- Fuel Supply
- Unplanned Maintenance

- Reality

- **Systemic
Overbuild**

- Market Liquidity
 - Failure to Manage
Market Risks
 - Excessive Leverage
 - Inadequate Working
Capital

Why Is There Overbuild?

- Regulatory/Market Structure Changes
- Lack of Barriers to Entry
- Cheap Money
- Build Decisions Based on Lagging Price Events
- Collective Underestimation of Market Response

Why Merchant Generation Projects May Fail (Part II)

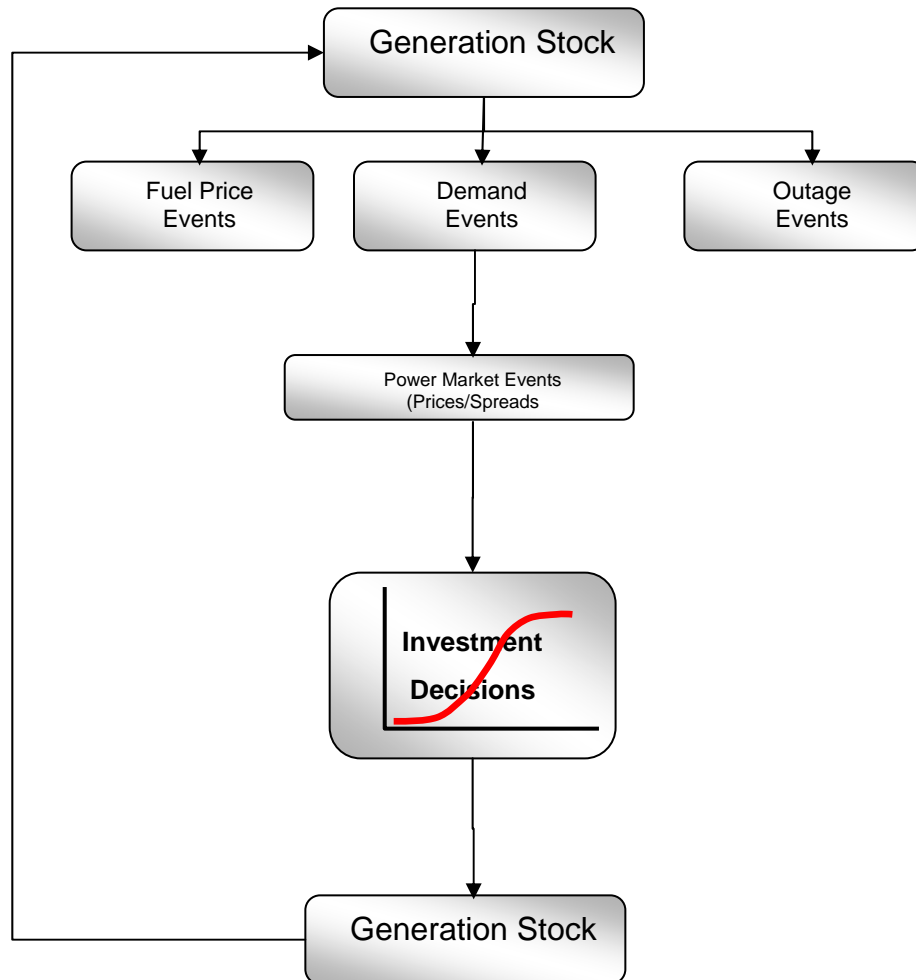
- Past

- Systemic Overbuild
- Market Liquidity
- Failure to Manage Market Risks
- Excessive Leverage
- Inadequate Working Capital

- Future

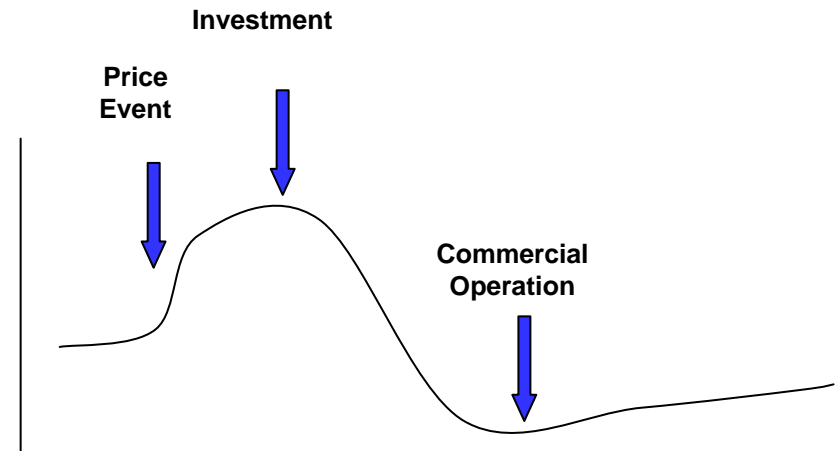
- All of Those Plus:
 - Performance of Unproven Technologies
 - Wind
 - Solar
 - Biomass
 - Reliance on Revenue Streams of Emerging Markets
 - Carbon Dioxide
 - Renewable Energy Certificates

Modeling Investment Cycles

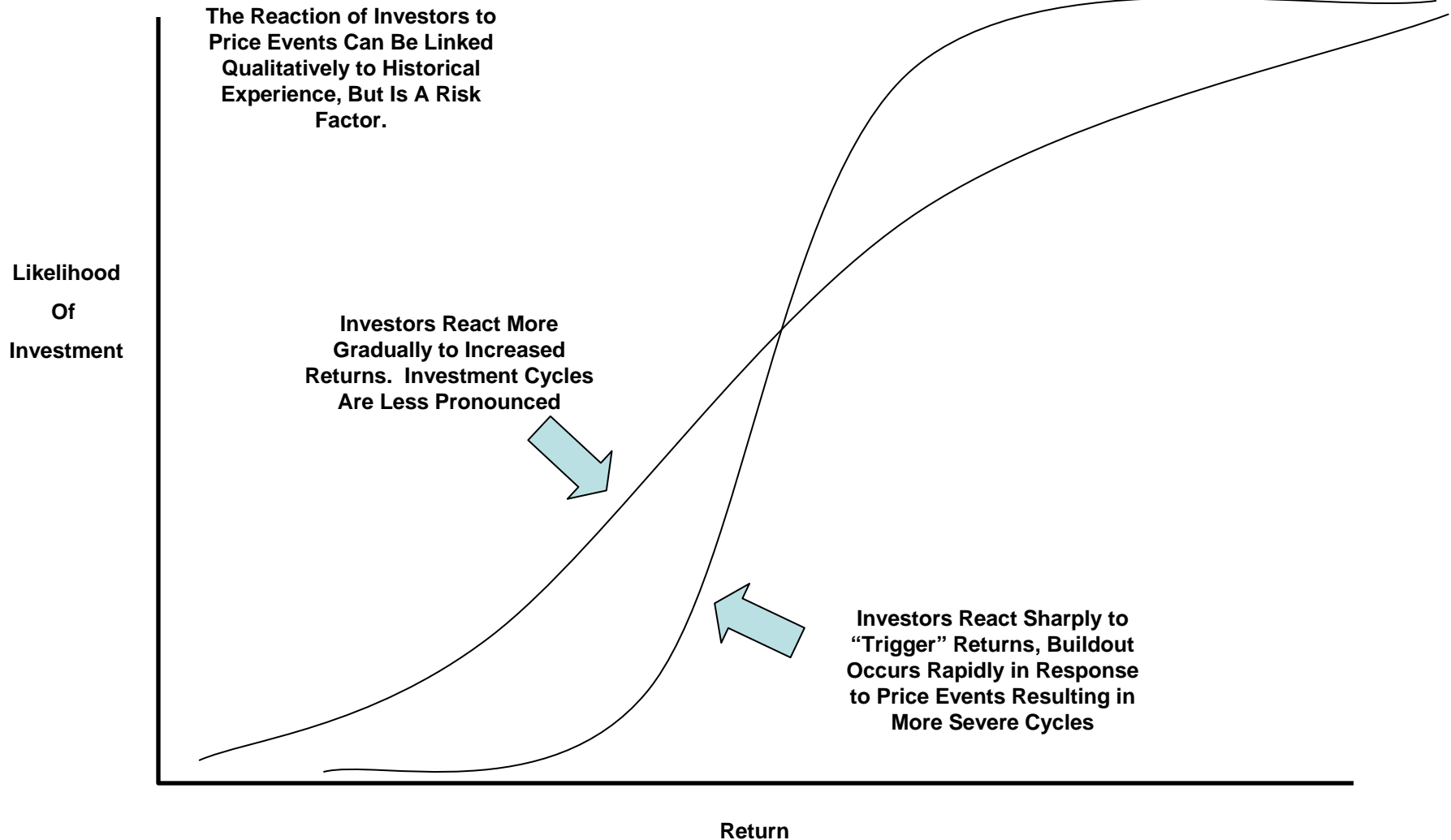


- Cycles (Length/Severity) Driven By:

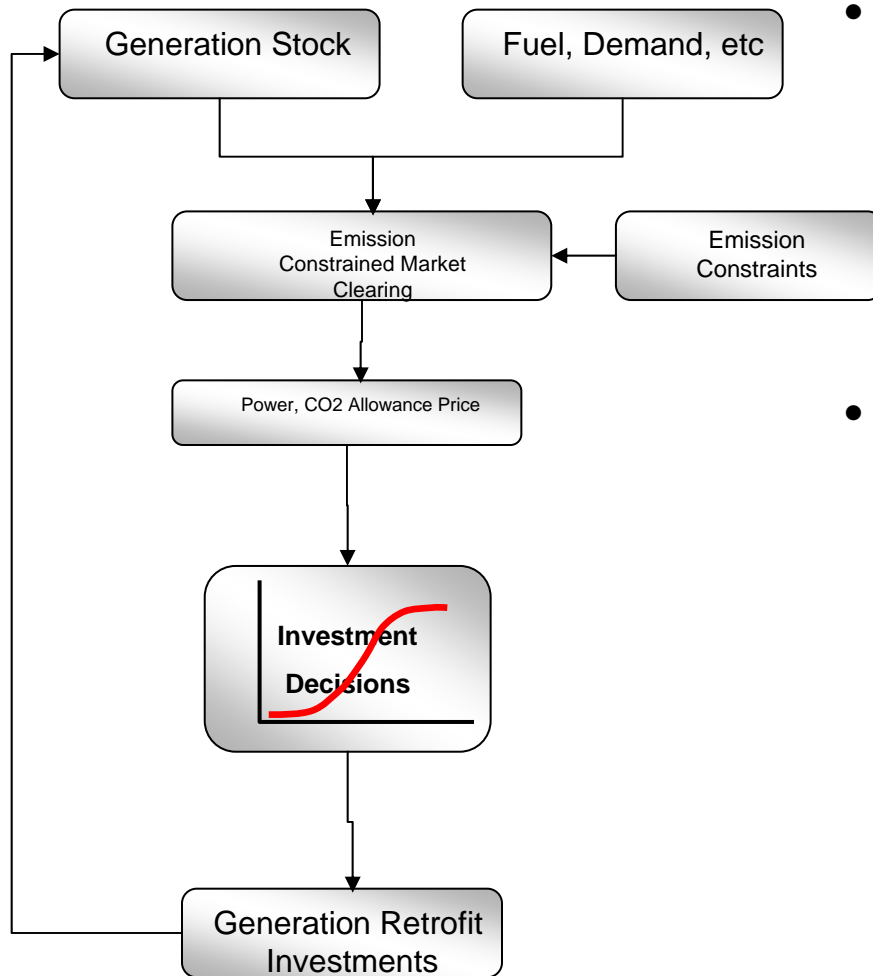
- Price Events
 - Size
 - Duration
- Sensitivity of Investment Decisions to Price Events
 - Time Lags
 - Size of Reaction
- Lag Between Investment Decisions and Commercial Operation



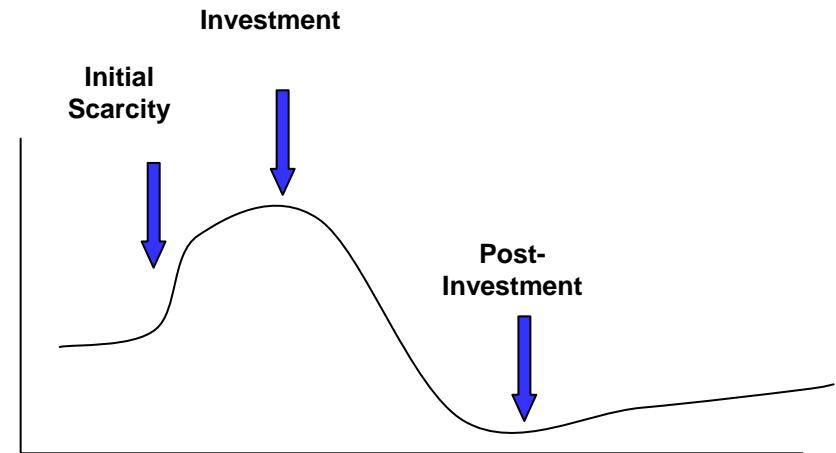
Investment Functions



Emerging Environmental Market Risks

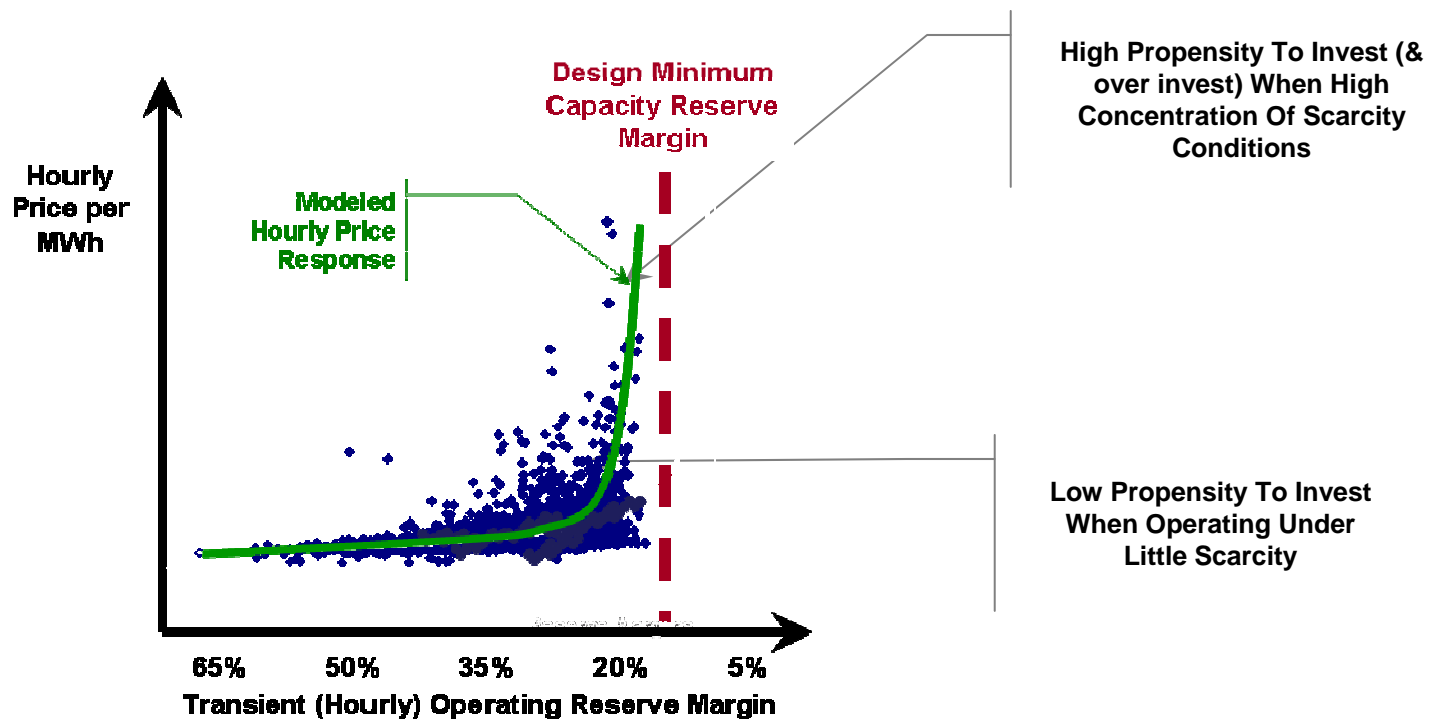


- The Value Proposition For Many New Generation Projects Is Built Around
 - Impact Of CO2 Cap And Trade Regimes On Electricity Prices
 - The Price Of Renewable Energy Certificates
- We Expect Cycles To Emerge

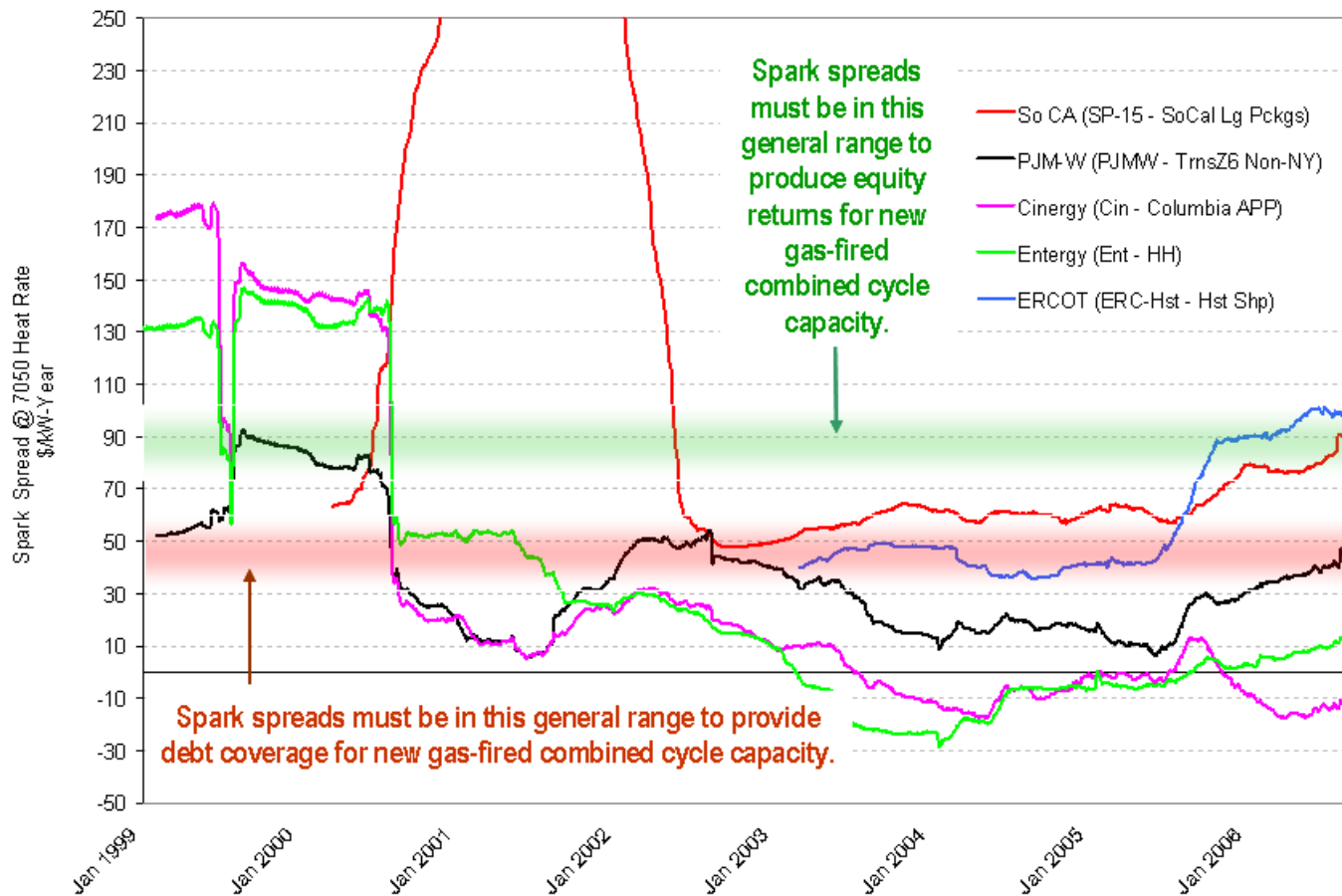


Bidding/Scarcity Premiums & Oversupply Discounts

- We know that prices in power markets react non-linearly to scarcity and oversupply situations
 - Exponential response to scarcity in energy markets
 - Near-zero margins in oversupply situations
- This can exaggerate the capacity construction-price feedback dynamic
- We expect these behaviors to appear in CO₂ and REC markets

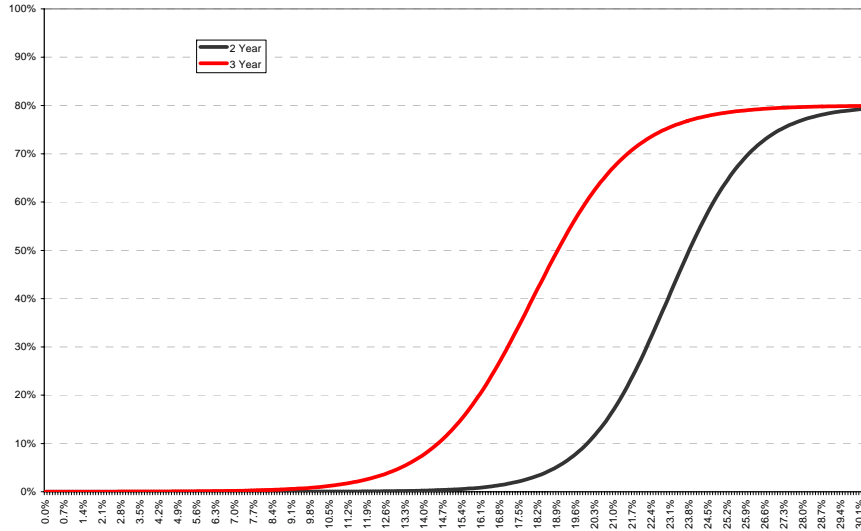


Construction Cycles and Default Risks (Real Life)

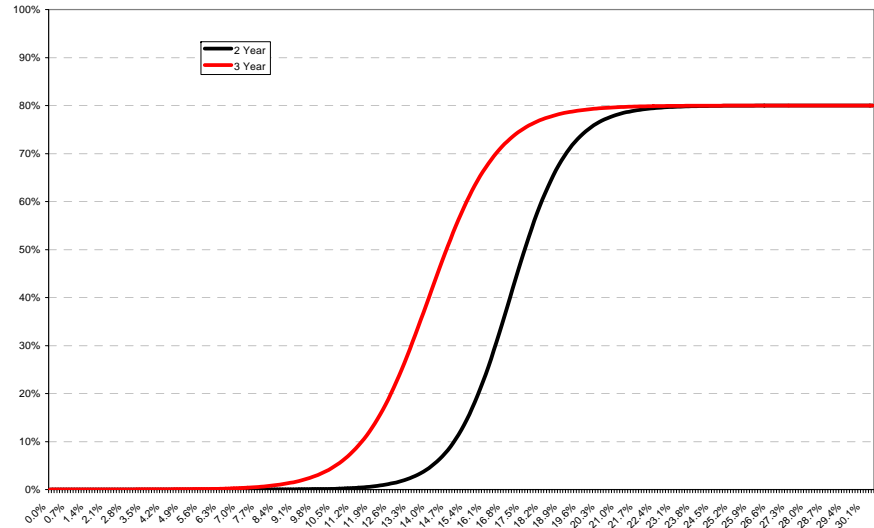


Calibrated Investment Functions

ERCOT IPF

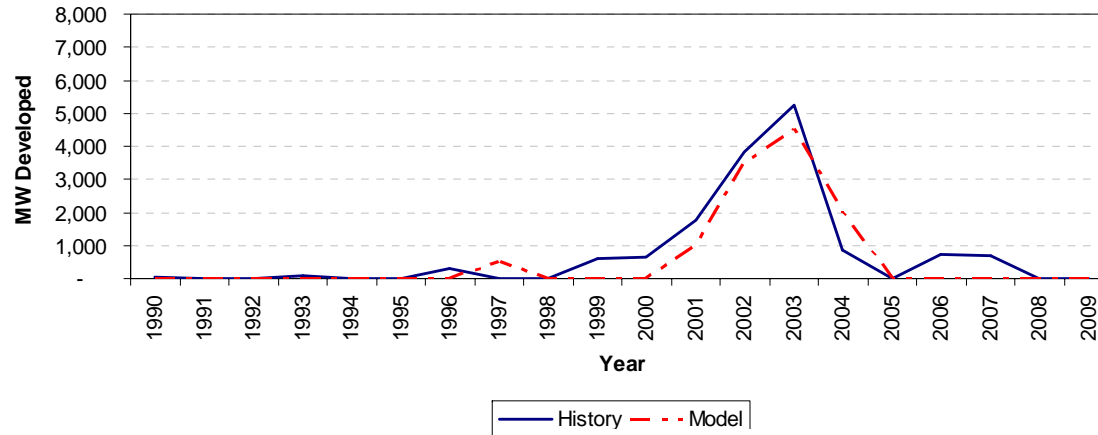


Entergy IPF

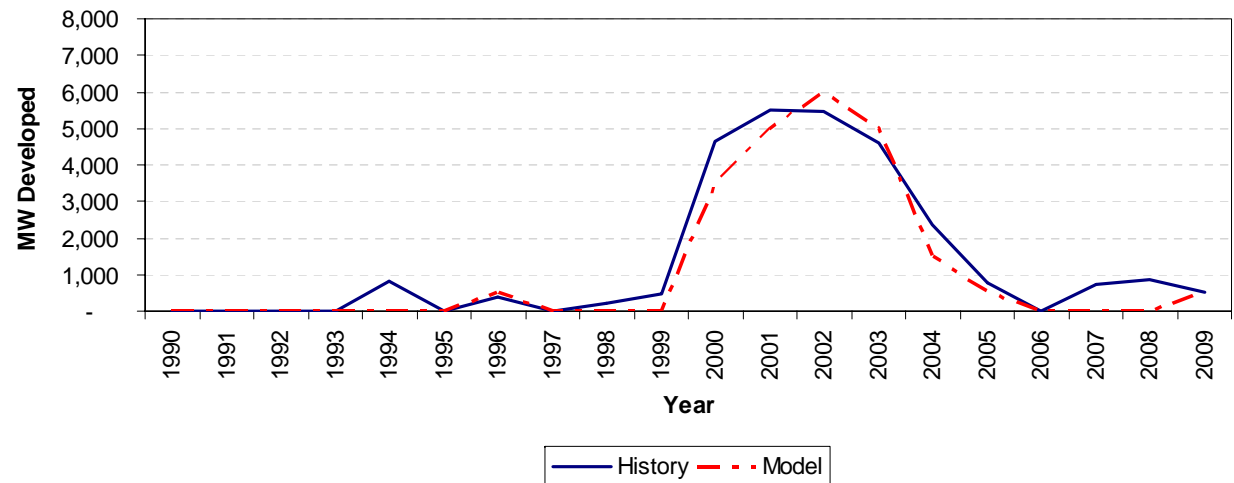


Investment Function Backtest

Entergy



ERCOT



Reference Case Analysis: Worse Than Useless?

- Problem

- The premise of a credit rating (or any other risk assessment) is that there is a risk of some event that will cause a project's cash flows to fall below what is necessary to service debt.
- Reference case analysis is based on steady-state equilibrium.
- Reference case encourage a false sense of security by implying that someone (like the market consultant) expects a steady-state outcome?

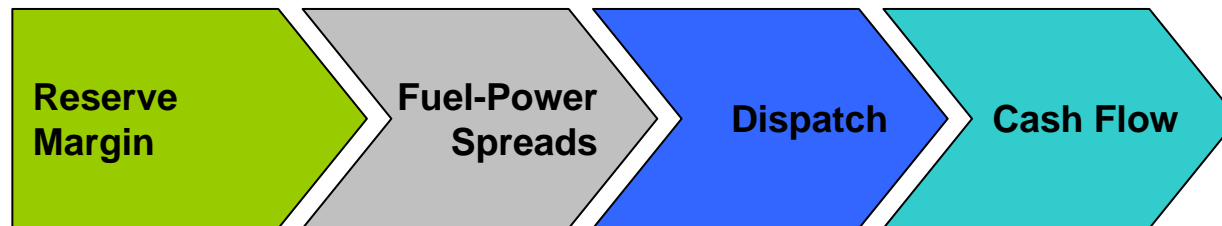
- Solution

- Stress Testing, but How?

States of the World-Approach 1

Risk Assessments Informed by Judgment, Tested by Scenarios

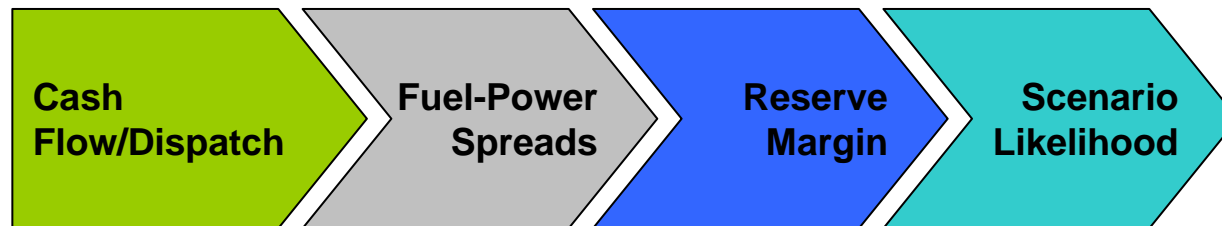
- Define Stress Values For Relevant Risk Factors Based on Historical Experience, Intuition
 - 5% Likelihood?
 - Largest Possible Quantum Shift
- Combine Stress Values in Scenarios or States of the World
- Calculate Financial Metrics Under Scenarios



States of the World-Approach 2

Reverse Engineer Default Scenarios

- Define Default or Near-Default Levels of Project Cash Flow
- Determine Values of Risk Factors Necessary to Reach Default Levels of Cash Flow
- Determine Likelihood of Default Scenario Occurring



Punchlines

- The Most Important Risks Can't Be Modeled Using Conventional Tools
- Investment Cycles and Systemic Overbuild Can Be Modeled
- Those Models Can be Calibrated to Historical Data
- Beware The Base Case
- Define The Stress Scenario Appropriately



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