

Presentation to the EPA Work Group on Advanced Coal Technology

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Overview

- Resurgence of coal-fired generation
- Substantial new investment in coal:
 - DOE/EIA & NETL: 129 – 154 plants
 - ± 77 GW of capacity
- Competing technologies:
 - Pulverized coal (“PC”)
 - Integrated gasification combined cycle (“IGCC”)
- 20 to 50 year life-cycle

Investor Perspective & Objectives

- Perspective is forward-looking, anticipatory and non-ideological
 - Past investments are “sunk costs”
 - The quest is grounded in reality, with the need to get it right
- Objectives:
 - To determine long-term fundamental and sustainable trend, and
 - To make a well-timed investment in anticipation of the trend

Investment Thesis

- Coal is abundant and cheap
 - \$1-2/mmBtu vs. \$7-10/mmBtu for natural gas
 - Price gap is wide enough to cover efficiency and environmental costs
- Coal has a strategic security value
- Coal-fired generation will play a major role in electricity production

Investor Needs

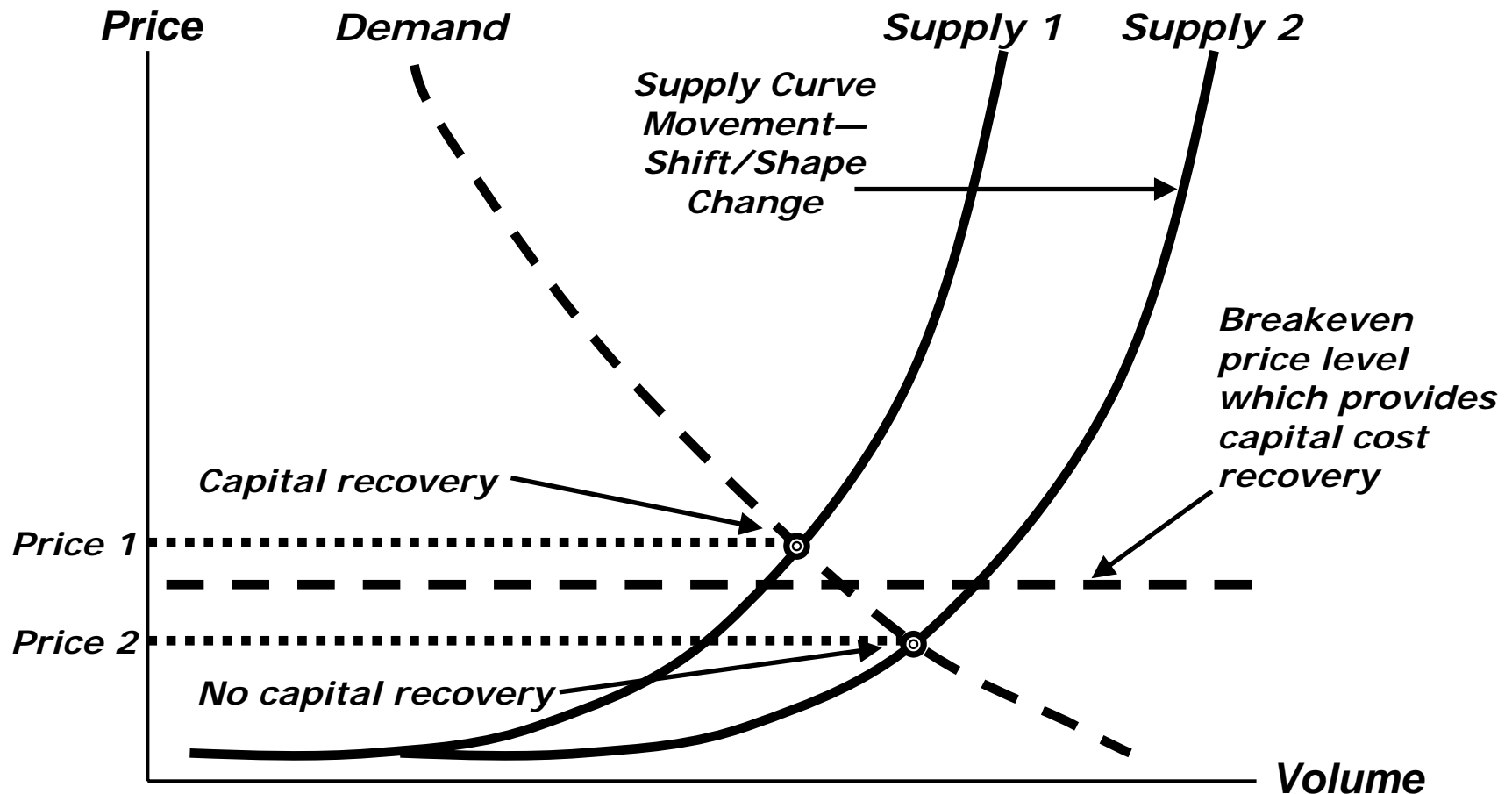
- Regulatory clarity and predictability
- Transparent market pricing mechanism
- Market depth and liquidity
- Ability to evaluate risk and return
- Limitation of liability

Investor Issues

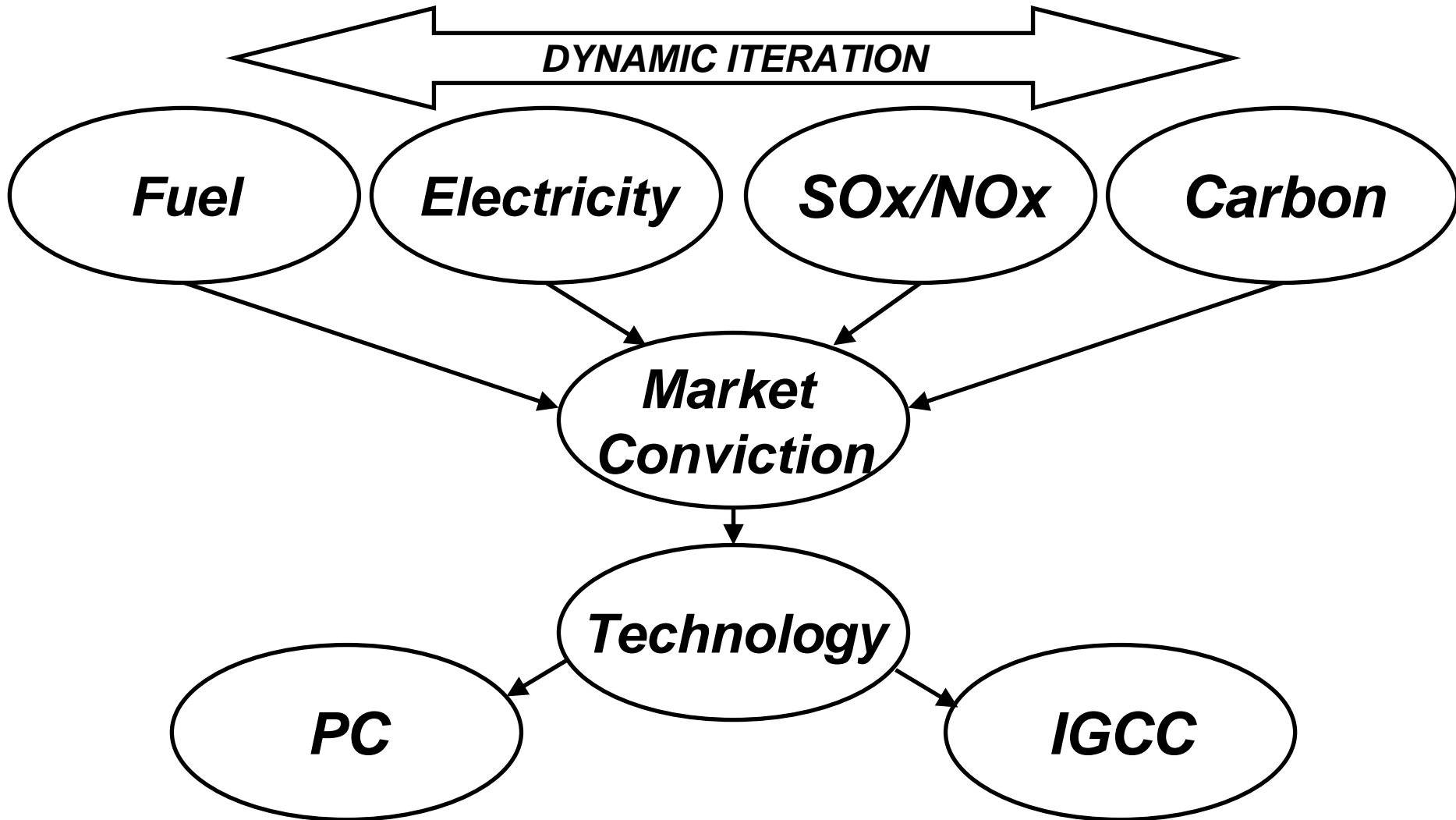
- Capital cost recovery in merchant markets
- Lack of fully-functioning US carbon market
- PC is well-established, reliable, fully-commercialized technology
- IGCC is not fully-commercialized
 - Capital and operating costs for IGCC unclear
 - Difficulty obtaining performance guarantees
 - Project-on-a-project risk
- Emerging carbon capture technology

Capital Cost Recovery

A movement in the supply curve—a shift or a change in shape because of carbon trading—can reduce market price below capital cost recovery



Investment Parameters



Investment Considerations

- Rate base treatment
 - Externalities and societal costs/benefits
- Stranded cost risk
- Accounting treatment
- Flexibility
- Optionality

Investment Analytics

- Conventional static analysis
 - NPV and IRR
- Probabilistic analysis
 - Decision trees
 - Monte Carlo simulation
- Dynamic probabilistic analysis
 - Options analysis
 - Consideration of volatility
 - Real option analysis with Monte Carlo

Flawed Assumptions

- Pre-investment for CCS is feasible
- IGCC is cheap and easy to retrofit for CCS
- The next wave of coal-fired power plants will be grandfathered from carbon charges
- A low carbon charge is always good for coal utilization
- Enhanced oil recovery (EOR) is a good use for carbon sequestration

Policy Considerations

- Market-based vs. command-and-control
- Carbon tax vs. cap-and-trade

Value of Market-Based Approach

