Market Price Forecasting and DCF Analysis

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Outline

- Environmental regulatory overview
- Potential impacts of impending power plant environmental regulations
- Market price forecasting
- Discounted cash flow analysis

Environmental Regulatory Overview
Major Regulatory Programs Affecting Power Plants

- **Air Quality Programs**
  - Cross State Air Pollution Rule (CSAPR)
  - Mercury and Air Toxics Standards (MATS)
  - Regional Haze Rule (mainly western power plants)
  - Clean Power Plan (CPP)* for existing power plants
  - Carbon Pollution Standards* for new power plants

- **Water Quality Programs**
  - Clean Water Act Section 316(b) Rule
  - Steam Electric Effluent Limitation Guidelines (ELG)*

- **Solid Waste Disposal**
  - Coal Combustion Residuals (CCR) Rule

* Proposed rules

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Potential Compliance Timelines

- **Cross-State Air Pollution Rule (CSAPR)**
  - Addresses air pollution through a cap and trade program

- **Mercury and Air Toxics Standards (MATS)**
  - Sets limits on hazardous air emissions at power plants

- **Ash Disposal Rule**
  - Places requirements on disposal of coal ash

- **Regional Haze Rule**
  - Requires controls on air emissions to improve visibility in national parks

- **Clean Water Act Section 316(b)**
  - Requires controls to limit impacts to aquatic life at cooling water intake structures

- **Clean Power Plan**
  - Sets carbon dioxide emissions limits for existing units

Source: Summary of Impacts of Environmental Regulations in the ERCOT Region, Warren Lasher, Director of System Planning, ERCOT, 3/31/2015
Clean Power Plan - Overview

- Affected sources – Electric Generating Units (EGUs)
  - 1,000 fossil fuel plants, 3,000 units
  - Vermont and Washington, D.C. not included (no fossil fuel-fired power plants)
- Power sector GHG emission reduction goals
  - 30 percent below 2005 emission levels by 2030
  - Co-benefit of 25 percent reduction in PM, NOx, and SO2 emissions by 2030
- Individual state rate-based emission standard (lbs CO2/MWh\text{net})
  - States have flexibility to convert to mass-based CO2 emission standard (tonnes/year)
- Schedule
  - Varies depending upon selection of individual state plan or multi-state plan
  - Initial state plans due summer 2016 (with potential for 1 to 2 year extensions)
  - Compliance begins summer of 2020

Clean Power Plan – Establishing State Goals

- EPA identified four building blocks for the Best System of Emission Reductions (BSER)
  1. Power plant efficiency improvements
  2. Re-dispatch (shifting coal generation to NGCC generation)
  3. Renewable energy generation
  4. Demand side energy efficiency
- EPA used the above four building blocks to determine individual state emission goals – from a 2012 baseline
- EPA is not prescribing what measures to be implemented by the individual states
- States have flexibility to submit individual state or multi-state implementation plans
**A Spectrum of Responses to the Proposed CPP**

**Legal Battles**

Legal challenges have been filed and more are likely as the rule is finalized.

**“Just Say No”**

Multiple economic assessments of impact of the CPP. No surprise – very different results!!

**Considering Implications**

NERC completed a Phase I report on potential reliability impacts of the proposed CPP in April 2015.

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**Potential Impacts of New Power Plant Environmental Regulations**
Cost impacts are very site-specific

Examples of potential new capital investments
  – Air pollution control equipment retrofits
  – New landfill development costs for wet to dry ash conversions
  – New ash handling equipment for wet to dry ash conversions
  – Wastewater treatment system retrofits
  – Cooling water intake structure modifications
  – Cooling tower retrofits

Some facilities cannot economically justify the required capital investments and will elect (or have elected) to retire.

Examples of potential changes in fuel costs
  – Coal switching
  – Natural gas co-firing
  – Coal to gas conversions

Potential fixed and variable O&M cost increases due to:
  – Additional operating labor
  – Additional maintenance labor and materials

Often plants are confronted with trade-offs of higher operating costs for lower capital costs.

Increased fuel and variable O&M may adversely affect dispatch price such that plant utilization (i.e. capacity factors) will decline.
Potential Impacts on Power Markets

- Additional coal-fired generation retirements.
- Replacement capacity expected to be primarily from renewables and natural gas-fired facilities.
- Potential increases in market clearing prices as a result of coal-fired generation retirements.
- Retirements expected to increase value of capacity markets in some regions.
- In some areas system reliability concerns exist due to projected retirements.

CPP Impacts on Generating Capacity in 2020

CPP Impacts on Generating Capacity in 2030


Environmental Regulations and Market Modeling

- In many cases market modeling is necessary to capture cost, dispatch, and profitability impacts of environmental regulations
- Environmental inputs to market modeling process
  - Identification of affected generating sources
  - Estimates of compliance capital expenditures and incremental O&M
  - Estimates of performance impacts
  - Expected timing of compliance expenditures and performance impacts
  - Emission allowance markets and projected allowance prices
Examples of research and judgment inputs (e.g. for CPP modeling)

- Are states likely to adopt individual state implementation plans or to adopt “multi-state” compliance plans
- Are states or regions likely to adopt “rate-based” or “mass-based” emission standards
- “Glide path” to 2030 CO\textsubscript{2} Emissions Goals
- Economics of renewables versus conventional power plants
- CO\textsubscript{2} shadow prices to affect coal to natural gas dispatch shift
- Final CPP expected August 2015 – Changes are expected

Market Price Forecasting
Why is a Market Forecast Necessary?

- To make no projections is to assume nothing is going to change!
  - To simply extrapolate past production and current market prices is unrealistic!
- Market modeling addresses market dynamics in an internally consistent manner:
  - Effect on dispatch and market competitiveness
  - Consistency between fuel price and energy price projections
  - Economics of additions and retirements
  - Forecast of future capacity prices

What is a “Market Study”?

- Assessment of current market conditions
  - Supply and demand balance
  - Resource mix
  - Market structure
  - Environmental regulations
  - Renewable portfolio standards
- Projection of future market prices and plant performance
  - Market simulation model
  - Inputs to the market simulation model
  - Outputs from the market simulation model
- Uses of Market Studies
  - Environmental Policy Evaluation
  - Integrated Resource Planning
  - Investment Decisions
    - Mergers and Acquisitions
    - New Build Economics
    - Portfolio Optimization
  - Appraisals and Valuations
    - Property tax
    - Financing
    - Purchase price allocation
    - Leasing
Dispatch Example

Historic and Projected Capacity Factor Subject CCGT

Coal Plant Retirements

Low Fuel Prices

Competition from New Technology

High Fuel Prices

Fuel, Emissions and Energy Price Example

Impact of Fuel and Emissions Prices on Annual Average Energy Price

Price on CO₂

Energy Price 2014$/MWh

Fuel Price 2014$/MMBtu
Energy Price Forecast Must Match Dispatch Profile

Market Prices, Realized Prices and Capacity Factors

DCF Analysis
Why is DCF Necessary?

- DCF analysis is the principal valuation approach used by market participants
- DCF analysis is the only way to quantify the effects of present and anticipated future market conditions on the market value of an asset in the absence of comparable sales
- DCF analysis is a primary means of quantifying obsolescence in the cost approach

DCF Analysis Inputs

Market Model
- Energy Revenue
- Capacity Revenue
- Dispatch (capacity factor)
- Fuel Cost
- Emissions Costs
- Fixed Operations and Maintenance
- Variable Operations and Maintenance
- Capital Expenditures

Operator or IE

Discounted
- Cash Flow
- Model

Capital Structure
- Interest Rate
- Equity Rate
- Income Tax Rate
- MACRS Depreciation Rates
Discount Rate Considerations

- The discount rate should be commensurate with the cash flow estimate
  - Regulated versus unregulated cash flows
    - Market based cash flows should not be discounted with a regulated utility discount rate
  - Amortizing debt model versus WACC
    - The equity rate of return ($R_e$) in an amortizing debt model is lower than the equivalent $R_e$ in a WACC model (decreasing leverage versus constant leverage)
  - Contract revenues versus market revenues
    - Contract revenues are less risky than market revenues and should be discounted at a lower rate of return

Regulatory Considerations

- Query: should regulated utility generation assets be valued using a market model or a regulated utility model?
  - Arguments in favor of a market model?
  - Arguments in favor of a regulated utility model?
  - Jurisdictional requirements?
Other Considerations

- Dominant market structure
  - Centralized energy and capacity markets (i.e. ISO, RTO)
  - Vertically integrated utilities
  - Hybrid
- Condition and remaining economic life of the asset
  - Renewables
  - Coal-fired
  - Natural-gas fired
- Power Purchase Agreements
  - Life of the asset
  - Merchant tail

Litigation Considerations

- Establish credibility with the decision maker(s)
  - Appraiser and subject matter expert background and experience
  - Market acceptance of market model and valuation techniques
  - Corroborate with other studies
- Educate the decision maker(s)
  - Judge/appellate board versus jury
  - Decision maker(s) background and experience
  - Relate modeling and valuation concepts to common problem solving situations
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Presenting (and Attacking) Market Forecasts in the Courtroom

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Agenda

- Explain the Need for Market Forecasts
- Seek Consistency/Avoid Inconsistency
- Income Approach Assumptions Should Be Consistent with Cost Approach Assumptions
- Mismatch of Tax Dates and Data
- Q&A

EXPLAIN THE NEED FOR MARKET FORECASTS

Presenting (and Attacking) Market Forecasts
Explain the Need for Market Forecasts

• Understand your decision maker, how sophisticated is it? (Specialized tax court judge, circuit court judge, jury?)
• If court typically deals with rental property, explain why valuation techniques (DCF) and information used by buyers and sellers of power plants is different (Market Forecasts).

Explain The Need for Market Forecasts, cont’d

• Explain why direct capitalization approach typically used for real estate simply hides many of the assumptions necessary for power plant valuation.
• Discounted cash flow explicitly recognizes that variables change in the future (capital expenditures are uneven, projected power and fuel prices don’t change based on inflation.)
Explain The Need for Market Forecasts, cont’d

• Value power plants for tax purposes by replicating how buyers and sellers of power plants decide what to pay for a power plant.
• Market participants use models so court should too.

Explain The Need for Market Forecasts, cont’d

• If persuading a jury, perhaps compare to an iPhone app – an “app” people use when they want a power price projection.
• If attacking or corroborating a model, consider presenting alternative sources for the data projected, such as reported prices from futures markets.
Seek Consistency/Avoid Inconsistency

- Nobody knows the future with certainty, but everybody knows mutually exclusive events can’t both happen.
• Many recent forecasts show coal-fired power plants driven out of the market through a combination of both cheap gas prices and increasingly stringent environmental rules.

• These assumptions drive up projected future capacity and energy prices.

• High prices result because old coal plants are removed from the market.

• Question: If the subject is an old coal-fired power plant without state-of-the-art pollution control equipment, what are its chances of actually being in the market long term to benefit from the projected long term high prices?
Seek Consistency/Avoid Inconsistency, cont’d

• Beware of a discounted cash flow for old coal-fired plants based upon only current capital expenditures and operating costs being projected into future.
• Beware of models generating high future prices without recognizing entry of new, efficient power plants that would lower prices.

Seek Consistency/Avoid Inconsistency, cont’d

• Remember the early 2000 boom and bust cycle, causing the reduction of energy and capacity prices.
• History repeats, lessons of history go unlearned.
INCOME APPROACH ASSUMPTIONS SHOULD BE CONSISTENT WITH COST APPROACH ASSUMPTIONS

Example

• Our appraiser used gas replacement plant to value the subject coal plant.
• Opposition used a replacement coal plant model.
• However, our client had a license to operate the software and modeling used by our opponent in their income approach.
Example, cont’d

• We could show precisely how our opponent’s price forecast was based upon new plants being gas, not coal.
Example, cont’d

- Not only were coal plants not being added for the forecasted price projection model, but opponent’s model was showing coal plants being removed.
- Assumptions drove up both capacity and energy prices at the time (gas price/coal price differential was higher at time).

Example, cont’d

Opponent’s Modeling of Power Plant Retirements (2000 Tax Year)
Example, cont’d

- Capacity removal, called “mothballing assumption,” in model was based on these plants covering less than 100% of their costs for 3 years.
- A large fraction of these plants were never restarted in the model.
- These assumptions trigger capacity shortage, which the model remedies by raising prices high enough to induce construction of new plants.

Presenting (and Attacking) Market Forecasts

**MISMATCH OF TAX DATES AND DATA**
Mismatch of Tax Dates and Data

- Forecasts require gas price projections, other fuel price projections, environmental assumptions and power plant operating data, none of which realistically can be obtained instantaneously on the tax date.
- The issue should be what would market participants use as of the tax date to determine the selling price or purchase price of the subject plant.

Mismatch of Tax Dates and Data, cont’d

- Typically, the more complicated the model, the longer the lag there will be between the vintage of the input data and the output.
- Beware of utilizing the wrong or mismatched vintage data set compared to the tax date.
- Watch out for off-the-shelf projections that are not current as of the date nor as of a retrospective tax date.
Mismatch of Tax Dates and Data, cont’d

• The typical customer wants to know what the consultant is projecting as of the date of the request, not two or three years ago.
• Consultants who save their historic projections may give discounts.

Thank You!

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Power Plant: Valuation-Litigation
Power Plant: Valuation-Litigation

- General Purpose of presentation
- Valuation Assumptions and Conditions that must be considered
- Appraisal Concepts and applications
- Marketing Forecasts
- Wrap-up

The general purpose of the presentation is “How do you convince a tax tribunal that the value is accurate and correct for the subject power plant property”.

- The application is called “KISS”
- Or “Keep it Simple and Short”
Assumptions

- The property is subject to some type of regulatory oversight: Federal, State, City
- Property is being valued at “Fair Market”
- Valuation is in accord with Uniform Standards of Professional Appraisal Practice and Generally Accepted Appraisal Standards

Assumptions (continued)

- All economic and environmental conditions are taken into consideration
- There are no liens or restrictions on the property or owners
- The valuation is for Ad Valorem Taxation vs. fee simple or some other type of value
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Appraisal Concepts and Applications

- All approaches to value must be considered: Cost, Income, and Sales Comparison (unless not applicable)
- Data must be available for each approach
- All approaches must be thoroughly explainable to a tax tribunal in layman terms, or the KISS approach

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Appraisal Concepts (continued)

- The correct type of Cost Approach must be used to match the property being valued
- This means that the appraiser must determine the type of regulation and apply the Cost Approach that fits the assets being valued, not just guessing at an approach
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Appraisal Concepts (continued)

- For the Cost Approach all forms of Depreciation “Must” be considered
- All Tangible, Intangible and Exempt assets must be included, unless excluded by law
- All environmental assets must be included, unless prohibited by law

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Appraisal Concepts (Income Approach)

- The appropriate level of income to be capitalized must be determined for application to the property. That may be: Gross Income: Net Operating Income or a Cash Flow Income. CAUTION: Whatever income level that is selected must be supported by documented factual data
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Appraisal Concepts (continued)

- The valuation must have an accurate measurement of a Capitalization Rate for the type of property being valued. For example: you cannot use a rate regulated cap rate for a non-rate regulated company as income is not the same and will create a mismatch.

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Appraisal Concepts (continued)

- Valuation is the simple IRV formula of: Income divided by a Rate equals Value.
- For a tax tribunal the more complex the description of the approach becomes, the greater the chance they will not understand the myriad of details within the approach.
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Appraisal Concepts (Sales Comparison)

- The tradition Sales Comparison approach is difficult to apply as there are generally limited or no sales of Power Plants. There may be portions sold, but in reality, the transactions are usually “Mergers and Acquisitions”.

Appraisal Concepts (continued)

- If this is the case, an appraiser may look at the “Stock and Debt” approach. But, this may not be totally appropriate based upon all the actions and reactions within the indicator.

- Thus, the Sales Comparison approach is best left out of the reconciliation of values.
Market Forecasting

- The application of market forecasting is a unique undertaking of looking at all the impacts of current and projected economic conditions, regulatory applications, business decisions and overall patterns and trends within the Power Plant environment.

Market Forecasting (continued)

- One should not say forecasting is “Bad” as it has a definite place in valuation, especially in the income approach with the use of the (DCF) or Discounted Cash Flow method.
- An appraiser needs to look at the quantity, quality and duration of the income stream elements in the application of the DCF
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Market Forecasting (Continued)

- As noted in Mr. Green’s, Dr. Frazier’s and Mr. Schneider’s presentations there are a vast array of items for consideration in the Forecasting Analysis discussions deserving follow-up thoughts and review.
- For a tax tribunal, it is important to make all information relative and down to earth.

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Wrap-Up

- It should be remembered that the goal of any valuation is to present a clear, simplified and accurate approach to value.
- “There must be convincing evidence that all areas have been completed, researched and documented for presentation.”
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Wrap-Up (continued)

- The appraiser must keep in mind that the valuation is for Ad Valorem Tax purposes and not to be used for justification of a revenue enhancement for the jurisdiction’s tax roll
- Remember to use the “KISS” method

QUESTIONS?
THANK YOU!